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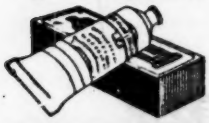

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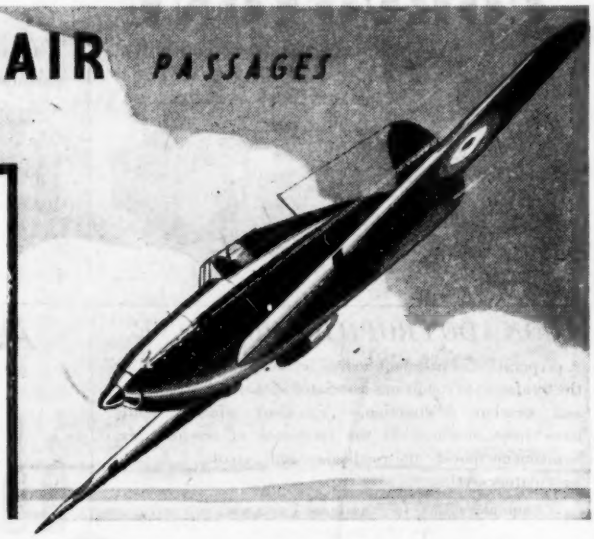

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14

ARTHRITIS IN POLIOMYELITIS

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ARTHRITIC changes in poliomyelitis are of considerable practical and theoretical importance, and perhaps not as generally recognised as might be supposed. It is to Miss Maud Forrester-Brown, surgeon in charge of the Bath and Wessex Orthopædic Hospital, that I am indebted for the opportunity to study them and indeed for calling my attention to them, when acting as a war-time consultant to this hospital.

As far back as 1881 Barlow pointed out that acute swelling ordinarily in one joint of the paralysed limb might arise synchronously with, or appear after, the development of the paralysis; that this swelling might reach a considerable degree and yet there might be no redness or heat. Further, it might persist for weeks or months. In 1910 Coutts added examples he had seen affecting the carpo- and metacarpo-phalangeal joints and compared the condition to the Charcot joint. This was denied by a speaker in the same discussion because of the great destruction in Charcot's disease, but it must be allowed that in diseases affecting the nervous system arthritic lesions need not of necessity be equally destructive. Brief allusion to the arthritis in poliomyelitis is made in some English works on children's diseases and I have no doubt that in other countries this arthritis has been often recorded; for example in 1937 Lowman was fully alive to it. Not the least claim in this article is made either to priority or originality, for this arthritis has been clearly recognised over many years. Reference also here may be made to sweating, which is not general but local, affecting the hands and feet, and to the occasional observation of sympathetic nervous changes both of which have been described in poliomyelitis. At this hospital the nursing staff have been so impressed with this local sweating that they speak of "wet" and "dry" cases.

CLINICAL FEATURES

Apparently about October, 1942, a number of cases of poliomyelitis arose in the wide area which this Bath hospital covers. Some were extremely severe, damaging both limbs and trunk muscles; others were mild, and possibly there were some so mild as to elude immediate observation; some came to hospital in the earliest stages, others late. It was among this group that a number of cases of arthritis were observed and it would appear that it was unusually common, though perhaps experience is necessary to be assured upon this; if it was unusually common, it recalls the variation in the occurrence of rheumatic subcutaneous nodules in "juvenile rheumatism."

Many joints were affected in these cases: the ankles, knees, hip-joints, elbows and wrists. As Barlow pointed out there was no redness, but heat over the joint was noticed in some examples. This arthritis might occur, as he also noted, with the acute onset or come on considerably later when the patient was under careful treatment. It appeared before any treatment (not even when the local quack "snail soup") had been administered, or when the most careful postural and nursing precautions were taken. In some cases the joints remained stubbornly swollen for weeks and months and not all made a complete recovery but underwent a fibrous ankylosis, and an ankle of a badly paralysed limb instead of being, as one would expect, flail-like, was fixed.

The onset of the arthritis was painful and in some young children so painful that they behaved like infants with scurvy screaming at the suggestion of movement. The most puzzling examples were those in which a single hip-joint was affected. Fullness could be detected over the front of the joint, but pain and spasm of muscles are seen when there is no arthritis. In the more chronic cases the impression was given of a thickening of the capsules of such joints as the knee and ankle, rather than an excess of fluid in them. Early radiography showed little, but the first evidences were a distended capsule and a certain "fluffiness" of the inner surface of the synovial membrane. In the chronic, severe cases there were thickening of the capsule, diminution in the joint space, and some rarefaction of the bones. In no instance was there suppuration, and complete recovery was the rule. The sudden appearance of the arthritis in cases weeks after the acute attack caused little or no rise of temperature, and it was pain in the joint that gave the warning. Many years ago Barlow described what he termed "jump" cases of poliomyelitis, that is a renewed spread of paralysis after the first attack had died down. Such attacks are well recognised now, and the arthritis would seem to fall into line with these "jump" cases. As a general rule in this group of cases, the arthritis was more likely to develop in the cases of severe widespread paralysis than in the milder ones, but not always. Thus I was shown a little girl with only one lower limb not severely paralysed, whose right hip-joint was clearly swollen and extremely painful and the disease in the acute stage. It is easily understood how puzzling such cases must prove, and indeed it is always the unusual cases of a disease which cause confusion. Does the arthritis occur in an unparalysed limb? The answer is not easy to make, for it may be difficult, especially when there are scattered severe paralyses, to be absolutely sure that there may not be a slight paralysis in another limb. The answer however seems to be in the negative.

CAUSATION

In considering the cause of this arthritis various possibilities present themselves. Poliomyelitis is recognised as being caused by a virus infection, but many cases commence with a sore throat and fever, and the possibility of an accompanying second infection is a reasonable suggestion. In the cases here there was no satisfying evidence of such an infection, no sudden bouts of fever and no implication of organs such as the lungs and heart, no signs of suppuration or involvement of subcutaneous tissues, such as the nodules in "juvenile rheumatism," or enlarged lymphatic glands, as in tuberculosis. The late outbreaks of arthritis in a joint were in line with the "jump" paralysis described by Barlow.

Was this arthritis the direct result of the nervous destruction, including damage to the sympathetic system? Such a view recalls the suggestion of Coutts on Charcot's joints, and the arthritic changes in syringomyelia. The rare condition of intermittent hydarthrosis threw no light on the problem. No-one can doubt that profound nervous damage would cause a liability to a weakened resistance of such a structure as a joint to any kind of infection, but the cases at the hospital did not suggest a direct nervous cause, but rather its contribution to the likelihood of an arthritis. Is it the direct result of the virus infection aided by the nervous damage? This question raises that of whether other human virus diseases may develop arthritis and this has been recorded in mumps and dengue fever, so that poliomyelitis does not stand alone. The history of the arthritis resembles that of the poliomyelitis both in its appearance at the onset of the attack and the later exacerbations.

It is customary to classify poliomyelitis into groups, such as bulbar, cerebral, meningitic and so on, but it is of interest to recognise many general symptoms in the Bath cases. Some of the younger children would have outbursts of great irritability, even biting the nurses in such attacks; a number showed mental fatigue, and in rare cases there was an altered mental state which lasted for many months, eventually to recover. Such incidents were reminiscent of the much more severe conditions in encephalitis lethargica. Then there was the local sweating and moist hands that are often met with in chorea and rheumatoid arthritis. These various symptoms suggest a widespread poisoning by the virus in which the joints may be involved, possibly more often in one year than another. Some might suggest the arthritis is caused by lack of treatment, or by the use of plaster splints to keep paralysed limbs in correct position. The answer here is that it occurred in cases that had no treatment and in cases which had the most skilled treatment by rest and suitable adjustment. It hardly seems likely that plaster splints were responsible seeing that the vast majority so treated never showed signs of arthritis.

The most likely conclusion seems to be that the arthritis is a manifestation of the virus infection and an unusual phenomenon of the general disease.

DIAGNOSIS AND TREATMENT

The practical importance of this arthritis in diagnosis seems clear. Writers on juvenile rheumatism include poliomyelitis as one of the pitfalls, and it is a setback to a doctor when he has called poliomyelitis *acute rheumatism* and later found a rapidly wasting limb. In my own experience it has been the pain which may occur in poliomyelitis that has been the reason for the mistake, and not the arthritis; but certainly the presence of a swollen joint would add to the likelihood of a mistake, particularly if the actual paralysis is not severe. Otherwise the rapid and scattered muscular wasting clinches the diagnosis. Extreme pain on movement is a feature of both diseases. There are other manifestations, cardiac in particular, which distinguish acute rheumatism, and the rapid rise of the sedimentation of the blood is very different to the slight change in poliomyelitis.

Tuberculous arthritis may be another pitfall and this particularly when the attack of paralysis is so slight as even to be overlooked and there is pain and swelling in a hip-joint. When this disappears and the child is found, owing to the slight paralysis of the affected limb, to limp, then tuberculous arthritis is likely to be suggested. Again it is found that while the blood sedimentation-rate alters little if at all in poliomyelitis, there is a sudden uprise at the commencement of a tuberculous arthritis. In addition the tuberculin tests are a warning, and if the paralyses are more spread and the muscular wasting more obvious the diagnosis of poliomyelitis will be the correct one. Very early X rays show no obvious difference in the two conditions, but later the destructive nature of tuberculous arthritis is apparent.

In some cases of *osteomyelitis* the joint is implicated, and again it is the unusual one of moderate but stubborn severity which may be puzzling. The altered sedimentation-rate, the absence of outstanding muscular paralyses and the picture in the X ray of the undermining of the cartilage of the joint are helpful, as also the absence of any outbreak of poliomyelitis in the district. Above all is the damage to the shaft of the limb.

Meningococcal arthritis is well known, and in a recent paper on cerebrospinal meningitis Copeman and Stewart (1942) suggested that the *Diplococcus rheumaticus* described by Paine and myself was in reality probably two different micrococci, one being the meningococcus the other the *Diplococcus rheumaticus*, and they also commented upon the nervous and muscular lesions in rheumatoid arthritis. The results of examination of the cerebrospinal fluid differ from those of poliomyelitis but these observations remind us of the complexities of the problems in human diseases, the more so when we recall encephalitis lethargica and the work of Schlesinger and his colleagues (1935), and Eagles and his colleagues (1937) on the virus theory of the origin of acute rheumatism.

The *treatment* resolves itself into keeping the affected joint at complete rest when the pain is thereby relieved. Occasionally a much swollen joint such as the ankle is assisted by careful strapping to add some gentle pressure. We are perhaps inclined sometimes, having thought that poliomyelitis is essentially a disorder of motor elements of the nervous system, to think the pain is not altogether real, but the occurrence of this arthritis warns us to be extremely careful in moving the child about for any active treatment lest we cause considerable distress.

CONCLUSION

The object of this paper is to point out that at least in some outbreaks of poliomyelitis, arthritis is comparatively common and this may not be generally recognised. This disease of virus origin and so destructive to the nervous system may possibly in the future help to throw light on rheumatoid arthritis and the nervous lesions in acute theumatism, and is certainly of great interest and stimulating to our thoughts on many different diseases in which nervous lesions and arthritis may occur.

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STREPTOCOCCAL MENINGITIS TREATED WITH PENICILLIN

MEASUREMENT OF BACTERIOSTATIC POWER OF BLOOD AND CEREBROSPINAL FLUID

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THIS case was one of those recently reported by Florey and Florey.[1] It was then included (case 12) in a series with many others and therefore the notes had to be severely abridged. The case was the first in which intrathecal injection of penicillin was used, and the first in which the bacteriostatic power of the blood and spinal fluid was systematically titrated throughout the treatment, so that it seems worthy of a more complete record. More especially it seems important that the methods used for testing the bacteriostatic power of the blood and cerebrospinal fluid should be described, for there is as yet no chemical test for penicillin in blood as there is for the sulphonamides, and the only way of estimating the penicillin content of the blood is by bacteriostatic tests. More patients are now being treated with penicillin both here and in America, and it is very desirable that estimations of the bacteriostatic power of blood, &c. should be made so that the dosage of the drug can be scientifically controlled.

It may be that a favourable result in this case could have been obtained by intrathecal treatment only, but at that time penicillin had not been used in this manner, and there was no knowledge as to how it would be tolerated or for how long it would remain active in the spinal fluid. The observations made on this case have enabled other cases of meningitis to be treated successfully by local treatment with an enormous saving of penicillin—an important thing in these days of scarcity.

CLINICAL NOTES

Male, aged 52. Fever began June 18, 1942. No localising signs. Admitted to St. Mary's Hospital on July 7. Temp. 100·2° F. No satisfactory diagnosis could be made.

July 14. Developed signs indicating meningitis. Drowsy and wandering with slight neck-rigidity. Lumbar puncture performed: pressure 300 mm.; CSF 500 cells per c.mm. (mostly polynuclears); globulin and total protein increased; the fluid was unfortunately not examined bacteriologically until next morning, and any infection was obscured by the presence of large numbers of non-pathogenic gram-negative bacilli. Sulphapyridine (1 g. 4-hourly) was administered. Temperature became normal in 12 hours and remained normal during the course lasting 8 days. The patient, however, remained wandering and drowsy throughout.

18th. CSF was clear. Still some polynuclear cells. No organisms discovered.

21st. Sulphapyridine stopped, and on the next day temperature rose to 100° F.; pulse-rate 100 per min.; sick, wandering. Definite head-retraction. Kernig sign positive.

24th. 24 c.cm. of CSF removed: pressure 300 mm.; turbid; cells all polynuclears; no organisms seen or cultivated. At this time the patient was drowsy with occasional fits of extreme restlessness. There had been incontinence of fæces at intervals. A persistent hiccough developed which could not be controlled and the patient was obviously going downhill. Sulphathiazole was administered from July 24 to Aug. 6 without improving the patient's condition.

Aug. 1. Lumbar puncture: CSF turbid with polynuclear cells; cultures of centrifuged deposit showed no colonies, but 3 c.cm. of fluid shaken in 10 c.cm. of "sloppy" glucose agar (0·2%) gave 20 colonies of a non-hæmolytic streptococcus.

4th. Lumbar puncture: fluid as before. By the same method ("sloppy" glucose agar) 6 colonies per c.cm. of the same streptococcus were cultivated, although no growth could be seen on a blood-agar plate inoculated with the centrifuged deposit of 4 c.cm. of the CSF. On subculture from the glucose agar the streptococcus showed the following growth characteristics:

Blood agar.—Small flat regular colonies not altering the medium.

Boiled blood agar.—Very small colonies. Where the

1. Florey, M. E. and Florey, H. W. *Lancet*, 1943, i, 387.

colonies were dense there was a slight greenish discoloration.

Agar.—Minute, transparent, round colonies.

Broth.—Faint, even turbidity.

Glucose broth.—Very dense even turbidity.

The cocci from broth and glucose broth cultures formed chains of up to 20 elements. The coccus was planted on blood agar containing gutters of sulphathiazole (1 in 5000) and penicillin (crude culture fluid). There was no inhibition of growth by sulphathiazole, but no growth occurred within 11 mm. of the penicillin, showing the organism to be resistant to sulphathiazole but sensitive to penicillin. The glucose broth culture was very acid, but when the pH was adjusted to 7 the culture formed a stable suspension suitable for agglutination tests. With the patient's serum agglutination was complete in a dilution of 1 in 80, and incomplete up to a dilution of 1 in 320, but none of the 12 normal serums tested gave any agglutination in dilutions of 1 in 10 or more. This confirmed the diagnosis that the streptococcus isolated on these two successive occasions was the infecting organism.

Aug. 5. Skull X-rayed for cerebral abscess with negative results.

Condition at the beginning of penicillin treatment.—On Aug. 6 we got in touch with Professor Florey who furnished a supply of penicillin for treatment. The patient was in a very bad state and appeared to be dying. He took little food; had been for days drowsy with occasional bouts of extreme restlessness; now drowsy, comatose, wandering and rambling; had been suffering from uncontrollable hiccough for 10 days; had been incontinent for a week, and on the night of Aug. 5/6 had to be stimulated with oxygen and coramine. On the evening of Aug. 6, two-hourly intramuscular injections of penicillin were begun. In 24 hours the patient was mentally clearer, the hiccough had disappeared and head-retraction was less marked. Temperature had fallen to 97° F.

Aug. 9. Sudden rise of temperature to 102° F. Drowsy. No sickness.

10th. Temperature again normal. Mentally more rational.

11th. Sudden rigor in morning (temp. 102° F.). Lumbar puncture: pressure 300 mm.; CSF turbid with polynuclear cells; no organisms.

12th. Temperature again normal. Lumbar puncture: 20 c.cm. CSF withdrawn and intrathecal injection of 5000 units of penicillin in 20 c.cm. of water given.

13th. Temperature 100·5° F. Mentally much more alert. Lumbar puncture: fluid withdrawn and intrathecal injection of penicillin repeated.

14th. Temperature normal. Lumbar puncture: fluid withdrawn and intrathecal injection of 2500 units of penicillin in 10 c.cm. of patient's serum given (with the object of providing opsonic substances which were lacking in the cerebrospinal fluid).

15th. Temperature normal. Lumbar puncture: fluid withdrawn and intrathecal injection of 5000 units of penicillin in 20 c.cm. of water given. Patient enormously improved but complaining of tiredness through lack of sleep, as he had had 2-hourly intramuscular injections since Aug. 6. Intramuscular injections discontinued from 8 PM to 8 AM.

16th–18th. Very alert and condition excellent. Intramuscular injections during the day only and discontinued on Aug. 18.

19th. Lumbar puncture: final intrathecal injection of 5000 units of penicillin in 20 c.cm. of water.

28th. Temperature has been normal for two weeks. Patient getting up. No sign of meningitis.

Sept. 9. Left hospital apparently well.

Sept. 24, 1943 (13 months afterwards). Patient has remained well. Recovery complete.

The dosage of penicillin, in thousands of units, was as follows:

Date: Aug.	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Intramuscular	30	120	120	190	240	180	160	105	90	100	90	90	90	
Intrathecal	..	..	..	..	..	..	5	5	2·5	5	..	..	..	5

Total: intramuscular, 1,605,000; intrathecal, 22,500 = 1,627,500 units.

BACTERIOSTATIC POWER OF BLOOD-SERUM

As it was undesirable to withdraw large amounts of blood daily from a very sick patient micro-methods were used. Staphylococci sparsely planted in human serum in capillary chambers such as slide cells or tubes grow out not as a diffuse growth but in well-defined colonies which can be easily recognised and counted. This happens not only when undiluted serum is used but also in dilutions of serum in normal saline up to over 1 in 100. Estimations of the bacteriostatic power of serum can therefore be made in serum diluted in saline, but it is more convenient to make the dilutions in a fluid which will by itself show the typical staphylococcal colonies, and such a fluid which is readily obtainable is human serum diluted 10 times in saline. This has the advantage over undiluted serum that it is a clearer fluid, and that the dilution eliminates any stray bacteriostatic substance which may be present in serum. The diluted serum is preferable to saline as a diluent, for in the serial dilutions the last volume can be left merely as diluting fluid, and if good colonies of staphylococcus develop in this and they do not appear in dilutions of the patient's serum then one is certain that the bacteriostasis is due to something in the patient's serum.

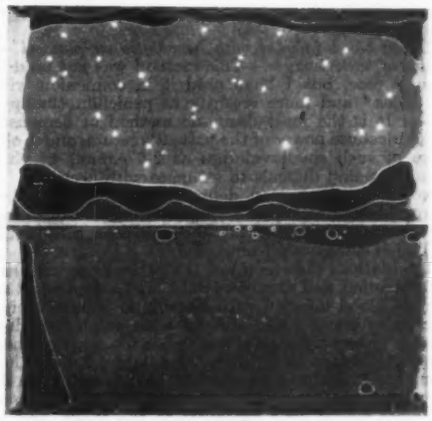


Fig. 1—Testing bacteriostatic power of patient's serum. Growth of staphylococcus in slide cells containing patient's serum. *Above*, before penicillin treatment, showing well-defined colonies. *Below*, after penicillin treatment, showing no colonies.

1. *Slide-cell method.*—Serial dilutions of serum (50 c.mm. volume) were made, and these were mixed with 2·5 c.mm. of a suitable dilution of a 24-hour broth culture of staphylococcus (1 in 80,000) or streptococcus (1 in 5000). The mixtures were run into slide cells, sealed and incubated. The organisms grow into separate colonies which are easily counted (fig. 1). The amount of the inoculum of the test organism is important. The number of colonies which develop from 50 c.mm. of infected serum should be between 15 and 50. If less than 15 there might be a danger that through some error of technique so few would develop as to make it doubtful whether bacteriostasis has occurred, while if large numbers are present the colonies are crowded and small, rendering it difficult to see in which dilution the colonies have failed to develop.

The serial dilutions may be done on a simple two-fold scale by putting out a series of 50 c.mm. volumes of the diluent on a paraffined slide, then mixing 50 c.mm. of the serum to be tested with the first volume, carrying over 50 c.mm. to the second volume and mixing it, and so on, till as many dilutions as are required have been made. If it is desired to work more closely, 50 c.mm. volumes of the diluent are placed on the paraffined slide as before, then 100 c.mm. of the test serum is mixed with the first volume, 100 c.mm. of this is mixed with the second volume, and so on. This gives (assuming undiluted serum is also used) dilutions of 1/1, 2/3, 4/9, 8/27, 16/81, &c.

There is no difficulty in measuring 2·5 c.mm. of the inoculum with sufficient accuracy using a home-made pipette,[2] provided that the outside of the end of the pipette is paraffined to prevent

2. It is easy to prepare calibrated capillary pipettes measuring from 2·5 c.mm. to 100 c.mm. by the aid of the "automatic pipette" described by A. E. Wright and L. Colebrook in their *Technique of the Teat and Capillary Glass Tube*, London, 1921 (quoted in the MRC *System of Bacteriology*, vol. IX, p. 178).

fluid adhering to it. This is readily done by heating the pipette by passing it through the bunsen flame (this is necessary to sterilise the pipette), and rolling the distal half-inch on a slide covered with a thin layer of paraffin wax.

2. *Capillary culture method.*—This is simpler than the above as it does not necessitate the preparation of slide cells, but the results are not quite so easily read. A 25 c.mm. volume of diluted serum is mixed with 2·5 c.mm. of culture diluted as above and the mixtures are run into capillary tubes so that the column of fluid occupies about 2 inches of the tube. The capillary is then sealed and incubated horizontally, stuck in position in "Plasticine" on a microscope slide. The organisms grow out into separate colonies. Observations by this method were made daily with results shown in table I.

3. *Using blood infected with hæmolytic streptococci as the indicator of bacteriostasis.*—This method was not used in this particular case, but I have used it in connexion with sulphonamides [3] and more recently in penicillin therapy with success. It is the most dramatic method of demonstrating the bacteriostatic power of the patient's serum, and it obviates the use of such small volumes as 2·5 c.mm., which many workers may find difficult to estimate with accuracy. *Strep. pyogenes* grows in human defibrinated blood in slide cells, and around each colony is a very definite area of hæmolysis. If many colonies are present and sufficient time is allowed the blood is completely hæmolysed.

Serial dilutions (25 c.mm.) of the patient's serum are made in normal saline, and to each of these is added an equal volume of human blood infected with hæmolytic streptococci. If it is a case which is being treated with sulphonamides it is necessary to be very careful not to use too large an inoculum (a suitable implant is 0·1 c.cm. of a 1 in 1000 dilution of a 24-hour broth culture to 1 c.cm. of blood), but when dealing with penicillin patients the amount of the inoculum within wide limits makes little difference to the result, and I have found it convenient to use a loopful of a 24-hour broth culture in 1 c.cm. of blood. Normally human blood has a considerable bactericidal power for these cocci, due to the presence of leucocytes, so to avoid any confusion and to give an accurate estimation of the bacteriostatic power of penicillin in the patient's serum the blood should, before infection with streptococci, have its leucocytes removed or destroyed. This can be done in various ways—

(*a*) By deleucocyting.[4]

TABLE I—BACTERIOSTATIC POWER OF BLOOD-SERUM

Date Aug.	Penicillin dosage in thousands of Oxford units every 2 hr. before blood taken	Hours after injection when blood taken	Bacteriostatic power of serum: Growth in dilutions of serum as under infected with—								
			Staphylococcus					Streptococcus (patient's)			
			1/1	1/2	1/4	1/8	1/16	1/1	1/2	1/4	1/8
6	0	..	+	+	+	+	+	+	+	+	+
7	10	2	0	0	±	+	+	0	+	+	+
8	10	2	0	0	±	+	+	0	+	+	+
9	10	2	0	±	+	+	+	0	+	+	+
10	20	2	0	0	0	0	+	0	0	0	+
11	15	2	0	0	0	±	+	0	+	+	+
12	15	1*	0	0	0	0	+	0	0	0	+
13	10	2	0	±	+	+	+	±	+	+	+
14	7·5	2	0	±	+	+	+	0	+	+	+
15	7·5	½*	0	0	+	+	+	0	+	+	+
16	10	2*	0	0	+	+	+	+	+	+	+
17	10	½*	0	0	0	±	+	0	0	±	+
18	10	2	0	±	+	+	+	+	+	+	+
19	..	18	+	+	+	+	+	+	+	+	+
20	..	48	+	+	+	+	+	+	+	+	+

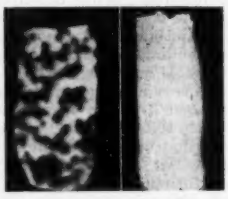
* Note increased bacteriostatic power when serum tested at shorter interval.
0 = No colonies. ± = Colonies smaller and fewer.
\+ = Colonies as large and as numerous as in the control normal serum.

3. Fleming, A. *Lancet*, 1938, ii, 564.
4. Fleming, A. *Brit. J. exp. Path.*, 1926, **7**, 281.

(*b*) By heating to 50° C. for 30 min.

(*c*) By adding liquoid to make a concentration of 1 in 1000. This is convenient as it prevents the blood clotting and renders defibrination unnecessary.

(*d*) By the use of blood which has been collected for more than 2 days, when most of the leucocytes have perished. The infected blood-serum mixtures are placed in slide cells, sealed and incubated. Where there is no bacteriostasis the streptococci cause areas of hæmolysis, but when the streptococci are prevented from growing no hæmolysis occurs. (These mixtures can be incubated in capillary tubes but the results are not so striking.) Fig. 2 gives a typical result.



a *b*

Fig. 2—Testing bacteriostatic power of patient's serum using *Strep. pyogenes* in blood as indicator. Serum (*a*) before and (*b*) after penicillin treatment. Dark spaces represent areas of hæmolysis due to streptococcal growth.

A permanent record of slide cells prepared in this way can easily be made. The series of cells are placed on a piece of bromide paper in the dark-room, and an accurate print is made by exposing them for 1 or 2 seconds to the light of an ordinary electric lamp placed 3 feet or so above the paper; or the slide cells may be placed in an enlarger and sharply focused enlargements may be made. These recording methods are so easy that if a dark-room is close to the laboratory it is almost quicker to make a print and incorporate it in the notes than it is to write up a description of the results.

This is probably the most convenient and convincing method of demonstrating the bacteriostatic power not only of serum but also of cerebrospinal fluid, or of any other body fluid.

By these methods the following observations were made:

(*a*) That the patient's streptococcus was only about half as susceptible to the bacteriostatic power of the penicillin-treated patient's serum as was the test staphylococcus. It had previously been determined that this was the ratio of sensitivity when cultures of these two organisms were tested to penicillin by the impregnated strip method on a blood-agar plate.

(*b*) That the patient's serum, which had no bacteriostatic power before penicillin was administered, promptly became bacteriostatic and maintained this power throughout the course of treatment.

(*c*) Normally the blood was collected 2 hours after an intramuscular injection (immediately before the next one), but on three occasions the blood was collected after a shorter interval and on all these occasions the bacteriostatic power of the serum was appreciably higher. The blood should be tested within a few hours of its withdrawal or, if the examination has to be postponed till next day, it must be stored in the refrigerator. If kept for 24 hours at room temperature the small amount of penicillin contained in the blood-serum may lose part or all of its activity.

CEREBROSPINAL FLUID

When first examined the cerebrospinal fluid was almost clear, but it later became definitely turbid from the presence of polynuclear cells. On several occasions no organisms could be discovered, but eventually by the use of "sloppy" glucose agar small numbers (about 6 per c.cm.) were found on two successive occasions. No organisms could be recovered on any occasion after the beginning of penicillin treatment.

After penicillin treatment had begun each specimen of CSF was examined in regard to its bacteriostatic power to staphylococcus and the patient's streptococcus. Tests were made by the same methods which were used for the blood-serum, but as CSF is a poor culture medium for staphylococci it was necessary to use normal serum (or diluted normal serum) as a diluent. The results obtained are set out in table II.

When the CSF contains considerable amounts of penicillin after intrathecal injection, estimations of the bacteriostatic power can be made by simple titrations in infected broth (using 0·5 or 1·0 c.cm. quantities), just as is done in the original titrations of penicillin.

TABLE II—RESULTS OF EXAMINATION OF CEREBROSPINAL FLUID

Date Aug.	Turbidity	Colour	Protein content (mg./c.cm.)	Conc. of CSF inhibiting growth		Conc. of blood-serum inhibiting growth (for comparison)	
				Staph.	Strep.	Staph.	Strep.
11	+	Nil	...	1 in 2	2 in 3	1 in 4	1 in 1
12*	+	Nil	140	1 in 2	5 in 7	1 in 8	1 in 4
13*	+++	Yellow	160	1 in 40	1 in 20	1 in 2	1 in 1
14*	++	Yellow	130	1 in 160	1 in 40	1 in 2	1 in 1
15*	++	Yellow	240	1 in 40	1 in 40	1 in 2	1 in 1
19	Trace	Nil	70	No inhibition in 67% CSF		No inhibition in undiluted serum	

* Intrathecal injections of penicillin.

The bacteriostatic power of the CSF was also tested by the "agar cup" method, in blood-agar plates, with the following results:

Date	Distance of inhibition from edge of cup (mm.)	
	Staph.	Strep.
Aug. 12	0	0
,, 13	13	4
,, 14	14	6·5
,, 15	11	2·5
,, 19	0	0

The bacteriostatic power of the CSF withdrawn on Aug. 14 (which had been found to have the highest value) was compared with that of sulphathiazole (1 in 5000) by the "impregnated strip" and agar cup methods, with the following results:

Method	Organism	Distance of inhibition from drug (mm.)	
		CSF	Sulphathiazole 1 in 5000
Impregnated strip	Strep.	11	0
Agar cup	Staph.	15	5

COMMENTS

Diagnosis.—When the patient was admitted there were no signs or symptoms pointing to meningitis. As soon as any localising signs were observed the state of the CSF indicated a meningitis, but the infecting organism could not be seen in the fluid nor was it cultivated until a special method—"sloppy" glucose agar—was used. Even then it appeared to be present in very small numbers, about 6 per c.cm. The infecting streptococcus was of an unusual non-hæmolytic type, but that it was the actual infection was shown by the fact that, apart from its being isolated in pure culture on two successive occasions, it was strongly agglutinated by the patient's serum but by none of the normal serums tested.

Clinical effect of sulphonamides.—The first course of sulphapyridine brought the temperature down to normal, but as soon as it was stopped the fever returned, and a subsequent course of sulphathiazole had no effect. When the streptococcus was isolated it was completely resistant to sulphathiazole. It may be that originally the infecting streptococcus was partially sensitive to the sulphonamides, so that at first it was to some extent affected by the sulphapyridine, and then it became sulphonamide-fast, so that the subsequent administration of sulphathiazole had no effect. This, however, is supposition as the organism was not isolated until after sulphathiazole had been administered for some days.

Effect of penicillin.—When intramuscular injections of penicillin were commenced the patient appeared to be dying. Within 24 hours there was a definite improvement—temperature dropped, hiccough ceased, and he was mentally more alert. There were two rises of temperature after 3 and 5 days, and as the bacteriostatic power of the CSF had not risen as high as that of the blood an intrathecal injection of penicillin was given (5000 units in 20 c.cm. of water). This gave no clinical reaction although there was evidence of some slight irritation by an increased emigration of polynuclear leucocytes. The intrathecal injection was repeated on 3 successive days, and then half the dose was given intrathecally dissolved in the patient's serum to provide opsonic substances which were lacking in the CSF (as they are normally). Whether this last combination was better than mere solution in water it is impossible to say, but theoretically, since penicillin is essentially bacteriostatic so that the cocci have to be killed by the natural defences, it seemed reasonable to provide opsonic substances so that the polynuclear cells which were abundant in the fluid should be able to ingest and destroy the cocci.

The intramuscular injections caused little or no local reaction, but as they were given every 2 hours day and night for 9 days the patient ultimately complained of tiredness from lack of sleep. The injections were then continued 2-hourly for 3 days during the day only and the patient was allowed to have a night's sleep undisturbed. It is likely that the treatment was continued too long, but as there was no satisfactory means of checking this it was considered wise to err on the safe side.

Bacteriostatic power of blood during penicillin treatment.—Throughout treatment a two-fold dilution of the patient's serum completely inhibited the growth of staphylococcus (except on a few occasions). The highest figure obtained (when the blood was taken immediately *before* an injection of penicillin) was complete inhibition of staphylococcus by an eight-fold dilution of serum. As regards the patient's infecting streptococcus, there was complete bacteriostasis by undiluted serum except on one or two occasions, and on one occasion a four-fold dilution of the serum completely inhibited growth.

It is possible, therefore, over a considerable period to render the patient's blood strongly bacteriostatic by 2-hourly intramuscular injections of penicillin.

If the undiluted serum is completely bacteriostatic dosage is probably sufficient, but if the bacteriostatic power of the serum can be increased so that a two-fold dilution or more is bacteriostatic it is an obvious advantage.

Bacteriostatic power of CSF.—Before the intrathecal injection of penicillin the bacteriostatic power of the CSF was less than that of the blood-serum, indicating that penicillin did not pass freely from the blood to the fluid. Fluid removed 24 hours after intrathecal injection on three successive days had a very strong bacteriostatic power, the highest reading being complete bacteriostasis of staphylococci in a 1 in 160 dilution of the fluid (blood-serum taken at the same time showed complete bacteriostasis only in a 1 in 2 dilution). This again showed that there was not a free interchange of penicillin between the CSF and the blood. The yellow colour of the impure penicillin injected was also very obvious in these specimens (as it was in the blood-serum to a lesser degree while intramuscular injections were being given). The last specimen of CSF, which was taken 4 days after an intrathecal injection of penicillin, had no yellow colour and no bacteriostatic power, so it is evident that the bacteriostatic power disappears at some period between 24 hours and 4 days.

Effect on the elements of the blood.—There was no change in the blood-urea or hæmoglobin content. Throughout the illness there was a polynuclear leucocytosis of about 15,000 per c.mm. As recovery progressed the leucocyte count fell to normal and remained there. There was therefore no indication that penicillin affected the kidneys or the blood-forming mechanism.

SUMMARY

A man of 52 who was apparently dying of a streptococcal meningitis made a complete recovery after intramuscular treatment with penicillin for 11 days and 4 concurrent intrathecal injections of the drug.

The patient had already received courses of sulphapyridine and sulphathiazole, and the organism had become sulphonamide-fast.

For one intrathecal injection the penicillin was dissolved in the patient's serum, to provide opsonic substances.

Neither the intrathecal nor the intramuscular injections caused any significant local or general reaction.

The bacteriostatic powers of the blood and cerebrospinal fluid were followed throughout penicillin treatment.

My thanks are due to Professor Florey for the supply of penicillin, and for his advice as to administration and dosage, to Dr. T. A. Kemp and Dr. Duncan Gregg for their assistance, and to Sister Downer whose unremitting care contributed materially to the satisfactory result.

MECHANICS OF HEAD INJURIES

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THE assumption that there is a mechanics of head injuries implies that, when the head receives a blow, the behaviour of the skull and brain during and immediately after the blow is determined by the physical properties of skull and brain and by Newton's laws of motion. The most important physical properties of brain are:—

(*a*) Its comparatively uniform density. Nerve tissue, blood, and cerebrospinal fluid all have about the same density as water.

(*b*) Its extreme incompressibility. Brain substance does not appreciably change its size when subjected to a pressure which is uniform in all directions (a so-called hydrostatic pressure), and the incompressibility is about the same as that of water—it would take, for example, a force of about 10,000 tons to compress the brain to half its volume.

(*c*) Its very small modulus of rigidity. That is to say, brain offers a very small resistance to changes in shape compared with the resistance it offers to changes in size. For example, every surgeon knows that it takes only a small force on a retractor to produce quite a large deformation of the brain—nothing remotely comparable with 10,000 tons.

(*d*) Compared with the feeble rigidity of the brain the rigidity of the skull is very great. For example, it takes about 1 ton to reduce the diameter of the skull by 1 cm.

(*e*) The shape of the skull and brain are important in deciding the location of injuries.

(*f*) It is reasonable to suppose that the brain behaves like the substances whose properties have so far been studied, and therefore that it is injured when its constituent particles are pulled so far apart that they do not join up again properly when the blow is over. In the case of a substance such as brain, whose modulus of incompressibility (bulk modulus) is large compared with its modulus of rigidity, the amount of pulling apart of the constituent particles is proportional to the shear-strain. (Shear-strain, or slide, is the type of deformation which occurs in a pack of cards, when it is deformed from a neat rectangular pile into an oblique-angled pile.) Hence the shear-strain present at any point in the brain should be at any rate a rough measure of the probability of injury at that point. In other words, shear-strains are the cause of injury, whereas compression and rarefaction strains are not. This is in conformity with the known results for peripheral nerve. Thus, Grundfest [1] found that nerves continued to conduct when subjected to a compression strain due to a pure hydrostatic pressure of 10,000 lb. per sq. in. Of course, this hydrostatic pressure is vastly greater than anything which can arise in a head injury. If, however, the pressure is not a purely hydrostatic one—if it is different in different directions—it must involve some shear, and a very small pressure of this type may be sufficient to injure a nerve. The injuries to nerves produced by crushing with forceps or by stretching are examples of the effects of shear. Even when a nerve is squeezed with a pressure-cuff, the pressures are not equal at all places and in all directions, and therefore there are shear-stresses. It is undoubtedly these shear-stresses, and not the hydrostatic pressure, which produce the effects on the nerve.

On the basis of the five properties (*a–e*) of the skull-brain system, one can predict the distribution of shear-strains, and therefore the locations of injuries, resulting from various types of blow. The mathematical theory falls naturally into two halves: (1) injury to the brain occurring as a result of distortion of the skull; and (2) injury to the brain occurring whether or not the skull is distorted.

1. Grundfest, H. Cold Harbor Symposia on Quantitative Biology, 1936, vol. IV, p. 179.

LOCALISED INJURY DUE TO SKULL DISTORTION

As one would expect, distortion of the skull is most severe near the point of application of the blow. It consists mainly of an indentation of the skull. If fracture of the skull does not occur, the shear-strains in the brain are mainly confined to a superficial region close to the dent; hence the injury to the brain consists mainly of a superficial bruising near the point of application of the blow. Waves of compression and rarefaction (sound waves) emanate from this region and travel back and forth through the brain, but since, as explained in (*f*), it is only shears which are injurious, these sound waves do not cause any damage.

If the skull fractures, then shear-strains are produced in the brain in the immediate neighbourhood of the fracture, so that the injury is comparatively superficial in this case also. A fracture in the skull is the most probable cause of tearing of the dura, particularly where it is strongly adherent, as in the very young and very old. When hæmorrhage from a large vessel does take place, its most probable location is where a fracture line crosses the vessel, because the shears are largest near the fracture. In this way, extradural, subdural and subarachnoid hæmorrhages can occur. The shears which arise as a result of skull distortion without fracture are much smaller and therefore probably hardly ever cause hæmorrhages from large vessels. Subdural and subarachnoid hæmorrhages from large vessels may also result from the second mechanism of injury, which will now be considered.

INJURY DUE TO ROTATION

As well as the strains which arise in the brain as a consequence of cranial bending there are others which could arise even if the skull were absolutely undeformable. These are called into play by the change in the velocity of the head caused by the blow. The most general type of change in velocity which a blow can produce can be analysed into a change in the straight-line, or linear, velocity together with a change in the rotational velocity about some axis. Hence the forces which the most general type of change in velocity can produce can be analysed into the linear acceleration forces due to the change in linear velocity, and centrifugal forces, coriolis forces and rotational acceleration forces, due to the change in rotational velocity. The linear acceleration forces tend to produce compressional or rarefactional strains which, from (*f*), have no injurious effect. The shear-strains, which are also produced by the linear acceleration, are small. They are produced mainly in the neighbourhood of foramina where tissue has a tendency to be extruded or sucked in, and in the neighbourhood of ventricles owing to the slight difference in density between CSF and brain tissue. These shear-strains produced by the linear acceleration forces are small compared with those accompanying the change in rotational velocity, and may therefore be neglected, at any rate as a first approximation.

Blood as well as tissue can be sucked in or pressed out through foramina as a result of either the linear acceleration or the skull bending, but owing to the viscosity and inertia of the blood the amount involved is small. In addition the effect only lasts during the blow. Hence, it can be neglected, at any rate as a first approximation. In any case it can never be the cause of, say, small capillary hæmorrhages in regions remote from foramina.

That no appreciable relative movement takes place between the constituent parts of the brain as a result of the linear acceleration may readily be verified by anyone who cares to fill a narrow-necked flask with water, and to add a little shredded cotton-wool in order to render visible any movement of the water. A purely linear change in the velocity of the flask produces no visible effect in the water—it moves bodily with the flask. Water has no rigidity, so that very small forces tending to produce deformations in the water would readily be detected if they existed. The idea that the brain is loose inside the skull, and that when the head is struck it rattles about like a die in a box, thereby causing coup and contrecoup injuries, is erroneous.

The centrifugal and coriolis forces called into play by the rotation can also be neglected, because they are

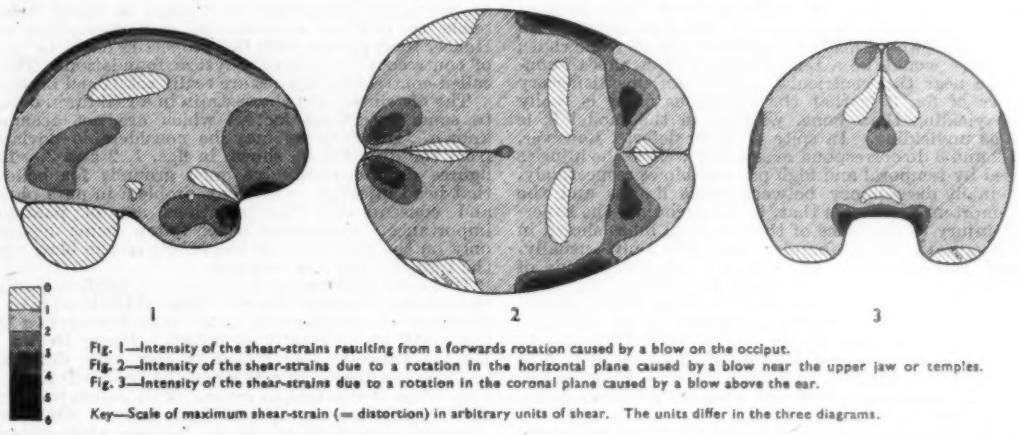

Fig. 1—Intensity of the shear-strains resulting from a forwards rotation caused by a blow on the occiput.
Fig. 2—Intensity of the shear-strains due to a rotation in the horizontal plane caused by a blow near the upper jaw or temples.
Fig. 3—Intensity of the shear-strains due to a rotation in the coronal plane caused by a blow above the ear.

Key—Scale of maximum shear-strain (= distortion) in arbitrary units of shear. The units differ in the three diagrams.

small, and not of a type very liable to cause injury. Usually the rotational acceleration forces are the main cause of brain injury. That the change in the rotational velocity of the head is likely to cause injury may easily be seen by giving a sudden rotation to the flask full of water mentioned previously. The water tends to stay behind, and only the flask rotates. Hence, as a result of the rotation a particle of water attached to the inside surface of the flask becomes separated from a neighbouring particle not thus attached. Large shear-strains are produced. Water is, of course, less rigid than the brain, so that this model exaggerates the effect of shearing stresses.

Fig. 1 is a parasagittal section of the brain passing through the tip of the temporal lobe. The shear-strains shown in it are those which are produced by a rotation such as might be caused by a blow on the occiput. The figure was obtained by making a model of this cross-section of the brain out of 5% gelatin, with ¼% formalin added as a preservative. The gelatin was cast into the paraffin-wax "skull," and then cut free with a taut wire. After this, the model was allowed to stand until slight adhesions grew across the water-filled gap between "brain" and "skull." By this means there was obtained a shear-strain distribution which was intermediate between that for the "brain" completely free from the "skull" and that for the "brain" firmly attached to the "skull." The gelatin adhesions had a rough mathematical correspondence with the attachments between the pia and the somewhat less extensible arachnoid. When the model, placed in a circular polariscope, was given a sudden forwards rotation, the shear-strains in the gelatin became visible owing to the colours they produced in the field of view (Coker and Filon).[2]

The strains could be calculated mathematically by the method of relaxations. Hence the jelly is to be regarded merely as an elegant and rapid calculator of the strains in a system with the properties (*a–e*). Gelatin is used merely for convenience. Exactly the same shear-strains would arise, for example, in glass or metal. Even in the case of an alloy consisting of an aggregate of crystals of different sizes, shapes, densities and elasticities, the shear-strains, averaged over regions large compared with the size of the crystals, are exactly the same as in gelatin. But the average shear-strain in a particular region of an alloy gives no clue as to what exactly happens to the crystals there. For example, the crystals may themselves be uniformly strained, or they may be strained only in parts, or they may merely move relative to one another. In the same way, though the shear-strains obtained from the jelly model indicate the regions of brain liable to damage, they give no indication of what this damage consists. It may consist of tearing of blood-vessels, tearing of axons, disrupting of cell bodies, tearing apart of synapses, or injuring of some parts of the nerves by amounts insufficient to cause actual breakage.

2. Coker, E. G. and Filon, L. N. G. Treatise on Photoelasticity, Cambridge, 1931.

The most prominent features of fig. 1 are the large amount of shear-strain in the anterior part of the temporal lobe, and the comparative absence of shear-strain in the cerebellum. The main reason for the large amount of shear-strain at the tip of the temporal lobe is that the skull gets a good grip on the brain in this region owing to the inwardly projecting ridge of the lesser wing of the sphenoid bone, so that the skull rotates the brain mainly by means of the force it exerts on this portion of the brain. Hence this is where most of the strains appear. Elsewhere the brain tends to slip somewhat relative to the skull, so that smaller strains are produced. The relative slip between brain and skull is greatest near the vertex, which is far removed from any place where the skull can get a grip on the brain to turn it round. Hence the brain tends to get left behind in this region and it therefore rubs against the skull more than in other places. The superficial region of strain in the vertex is due to the effect of friction and connexions between skull and brain. This allows the skull to get a small amount of grip on the brain. In the case we are considering, of a blow on the occiput, this region of superficial shear-strain due to rubbing would extend to the falx, against which the brain would rub in the same way as against the vertex of the skull. The comparative absence of strain in the lateral cerebellar lobe is due mainly to its small size—it does not require such large forces to make it rotate as are required to make the cerebrum rotate. It should be noted that there is hardly any part of the brain which is completely free from strain.

What evidence there is from autopsies in the case of blows on the occiput confirms a distribution of hæmorrhages corresponding roughly to the areas of highest strain shown in fig. 1 (see, for example, Courville).[3] It is, of course, possible that the brain is also damaged in regions where the strain is insufficient to cause hæmorrhage.

That shear-strains correspond to damage in the case of a jelly is shown by fig. 4, which is a photograph of the model taken after it had been subjected to a more violent rotational jerking. Note that besides the region of extreme fragmentation in the temporal and frontal lobes there is a superficial layer near the vertex. The slight damage in the lateral sinus and occipital pole is an artefact. The appearance of the jelly is remarkably similar to the post-mortem appearance of a brain after an extremely severe occipital injury.

Figs. 2 and 3 are shear-strain diagrams for typical horizontal and coronal sections rotated in their own planes. Fig. 2 shows the effect of a rotation which would be most easily produced in real life by a sideways blow in the neighbourhood of the upper jaw. It would also be produced to some extent by a sideways blow on the temples. The rotation in fig. 3 corresponds to that which is most easily produced by a blow above the ear. Both these sections are somewhat more unsatisfactory than the previous one because the effect, on the section considered, of strains in neighbouring sections is more

3. Courville, C. B. *Arch. Surg.* 1942, **45**, 19.

marked than before. In addition, both these sections should really have sections of ventricle included in them. This would disturb the strain system somewhat; and there would be a tendency for the strains to congregate near the ventricular walls. An unsatisfactory feature of fig. 3 is that the cavernous sinus is really more yielding than bone, whereas in the model it is just as unyielding. In spite of these defects, however, figs. 2 and 3 do correspond reasonably well to the injuries caused by temporal and high parietal blows respectively. The main discrepancy between these figures and the post-mortem findings is that, by all accounts, the superficial injury at the sides of the temporal lobes shown in fig. 2 appears to be found at one side only—usually, though not invariably, the opposite side to the side of the blow (Courville [3]). It must be remembered, however, that these two figures refer only to those unusual cases in which the rotations are exactly in the planes of the sections. It will be just as unusual therefore to find exactly symmetrical damage of this type as it is to find exactly symmetrical damage due to a blow on the occiput. There are other less obvious factors making for asymmetry.

As the brain is so incompressible, it will be impossible for any empty spaces to be formed anywhere as a result of the blow. Hence, since no spaces can be formed between the skull and brain, the surface of the brain can never move away from the interior skull surface: it can therefore only slide along it. Since the dura is comparatively firmly attached to the skull, the motion of the dura relative to the skull will usually be negligible. Hence the main motion must be the sliding of the pia relative to the arachnoid and of the arachnoid relative to the dura—the latter being presumably greater. In this process the vessels which drain the cortical veins

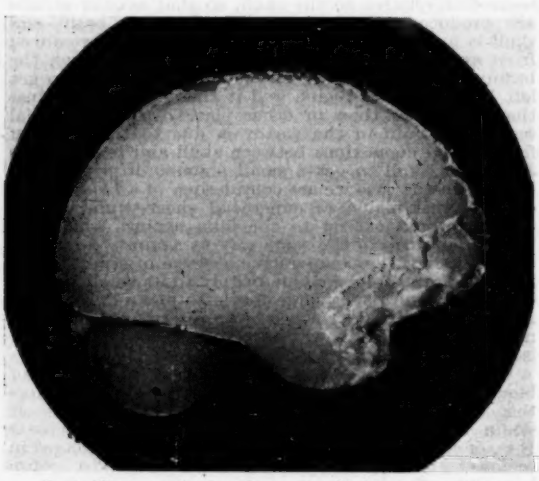

Fig. 4—Effect on a jelly of a violent rotational jerking in its own plane.

into the venous sinuses will be stretched, and may break anywhere along their length, causing subdural or subarachnoid hæmorrhages. For a rotation in the plane of fig. 1, the relative sliding motion is greatest near the vertex, since it is furthest removed from any place where the skull or dural processes are so shaped as to get a good grip on the brain. Hence this is the most probable region for hæmorrhages of this type. For rotations in the planes of figs. 2 and 3 the sliding is greatest at the sides of the convexities, but there are no communicating veins in this position. For all directions of rotation the sliding is minimal in the neighbourhood of the base, so that the cranial nerves, arteries and veins of the base usually escape rotational damage. When the pia moves relative to the arachnoid, the tethering trabeculæ and perforating vessels may be torn. This type of injury is most likely to occur near the vertex for rotations in the plane of fig. 1, and at the sides for rotations in the planes of either figs. 2 or 3.

If the gelatin model were given a purely linear change in velocity, no shear-strains would be visible, because, as previously mentioned, a change in linear velocity tends to produce compression and rarefaction only. Hence, for a system with the properties (*a–e*) the theory of contrecoup is without physical foundation. The so-called contrecoup injuries are really rotational injuries.

The distribution of shear-strain in a real brain depends to some extent on factors which are not accurately known. Hence there may be considerable deviations from the distribution shown in figs. 1, 2 and 3. These figures do, however, give good grounds for believing that head injury is primarily a problem in pure physics, and consequently that rotations are of paramount importance. The results which follow, being dependent only on the neglect of all the effects of the blow except the rotation, are more certain.

If there is no rotation or only a very small or slow one, there is no rotational injury. Thus, if the head is so well fixed that it cannot rotate at all when it receives a blow, there will be no rotational injury. Denny-Brown and Ritchie Russell [4] found that it was very difficult to produce concussion in cats when the head was fixed, but easy when it was free to move. This points to the fact that concussion is a rotational injury. One would certainly expect it to be so because skull-distortion injury is localised, and because much greater local injury to the cerebral hemispheres can be produced at operation without loss of consciousness. As is shown in figs. 1, 2 and 3, rotational shear-strains are present throughout the whole brain in greater or lesser degree, and are therefore much more likely to be the cause of a phenomenon such as unconsciousness. Up to the present, technical difficulties have prevented any estimation of the shear-strains in the brain stem. When a person's head is crushed between the slowly moving buffers of two railway trucks in a shunting accident, only a slow rotation can be produced; and in such accidents there is usually no concussion.

The momentum of a rifle bullet is surprisingly small, and therefore the rotational velocity it can produce is small. If a 10 g. bullet travelling at 400 metres per sec. is completely stopped by the head, the rotational velocity produced is about the same as that produced when one walks into a wall at 2 miles per hour. It is well known that wounds from low-velocity bullets often do not produce concussion. A bullet, owing to its small mass, is an example of an object having a large kinetic energy and at the same time a small momentum. It is owing to this that in low-velocity gunshot wounds the plainly visible injury to scalp, skull and brain in the path of the bullet (which depends mainly on the kinetic energy) is much larger than the invisible damage due to rotation (which depends mainly on the momentum). On the other hand, when the head hits a wall or a pavement, the masses involved are large so that the kinetic energies are small and the momenta large. Hence the plainly visible injury is in this case small compared with the invisible damage due to rotation. Now objects which are generally found in motion—bullets, balls, bricks, &c.—are usually less massive than the stationary objects which one's head is likely to hit. Hence collisions with stationary objects will usually produce more rotational damage than one would expect from the external injury. This is no doubt why it is often said that it makes a difference whether the head or the object causing the injury is in motion—a statement which, taken at its face value, is clearly absurd. For certain directions of blow at certain points of the head—notably points on the midline—a blow, however hard, produces no rotation. In association football, the direction of the ball and the point of the head at which it is "headed" are related in such a way that little rotation is produced by the impact. As an example of the opposite effect, one of the easiest ways of producing a rapid rotation of the head is to strike the chin sideways and upwards. This is the favourite knock-out blow in boxing.

For blows of long duration, the shear-strains in the brain are proportional to the force (assuming that the direction and point of application remain constant). That is to say, the injury is independent of the time for which the force acts. Hence one might say, from Newton's second law, that the injury is proportional to the acceleration, or rate of change of velocity of the head. On the other hand, for very short blows the injury is

4. Denny-Brown, D., and Russell, W. R. *Brain*, 1941, **64**, 93.

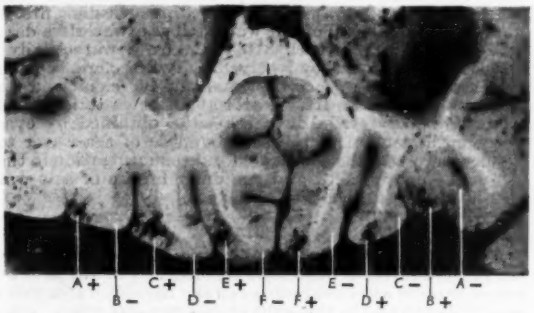

Fig. 5—Section showing large-scale symmetry combined with positive-negative symmetry in the details.

proportional to the force multiplied by the time for which it acts. Hence, from Newton's second law, the injury is proportional to the change of velocity of the head and not to the rate of change—i.e., acceleration. For this reason, the term "acceleration concussion" may well prove misleading. The change-over from one law of injury to the other occurs gradually somewhere in the region between 1/5 and 1/500 sec. Experiments are in progress to find a more accurate value for the critical duration of the blow. The change-over from one law of injury to the other is accompanied by a change in the distribution of the shear-strains. Figs. 1, 2 and 3 refer to forces of long duration.

Using the fact that the change in linear velocity produces no effect, and using the theorem in kinematics that any rotation about any axis is equivalent to an equal rotation about any other axis together with a translation, we have the result that equal rotations about all parallel axes produce exactly the same injury. For example, it makes no difference whether the rotation takes place about an axis through the centre of the brain or about a parallel one through a point in the neck.

Figs. 2 and 3 show sections of the brain in which the right-hand side is the mirror-image of the left-hand side. The strains on the right-hand side are also the mirror-image of the strains on the left-hand side. This symmetrical distribution holds for rotations about any axis lying in the median plane. But this result only holds accurately in the case of simple substances such as gelatin. For substances such as brain, in which the Young's modulus of elasticity for stretches parallel to the fibre directions may be different from the modulus for stretches perpendicular to the fibre directions, and in which the relationship between stress and strain is non-linear, this symmetry is not perfect. A more accurate statement of the facts in the case of rotations about any axis in the median plane is as follows: the large-scale injury on one side of a symmetrical section of the brain is approximately the mirror-image of the large-scale injury on the other side, but the minor details need not be mirror-images—for example, they may in exceptional circumstances be as it were negatives on one side and positives on the other. Fig. 5 shows the predicted effect. The injured gyri on one side correspond to the injured gyri on the other, but in each individual gyrus an injured portion on one side is the mirror-image of an uninjured portion on the other.

In the case of symmetrical sections, we can at once see that whether the rotation consists of a bending to the right or a bending in the opposite direction, the large-scale injury, being symmetrical, will be approximately the same in either case. But it can be shown that this result is not confined to symmetrical sections. For example, theory shows that the large-scale injury produced by the rotation which occurs when the head is struck centrally on the occiput is approximately the same as that produced by the opposite rotation which occurs when the head is struck centrally on the forehead (fig. 1 refers in fact to either blow). The details may, however, be different. In this connexion a remark by Courville is interesting: "Essentially identical lesions of the subfrontal and anterior temporal regions result from contact of either the frontal region or the occipital region of the moving head."

SUMMARY

The theory of head injury is developed on the assumption that, during and immediately after the blow, all factors other than the purely physical can be neglected.

On this assumption there are two main causes of injury: (1) deformation of the skull with or without fracture; and (2) sudden rotation of the head which is responsible for the so-called contrecoup injuries, for some intracranial hæmorrhages and probably for concussion.

The agreement between the theoretical predictions and the observed facts is good, considering the number of data which are only imperfectly known. Hence one can be reasonably confident that only minor modifications to the theory will be necessary to explain quantitatively the usual type of accident.

It is impossible to thank all those who have been helpful. This research would not have succeeded without the help of, among others, Prof. Hugh Cairns, Major W. Ritchie Russell, Dr. Dorothy S. Russell, Mr. G. F. Rowbotham, Dr. A. H. T. Robb-Smith and Dr. David Whitteridge, together with the facilities of the Oxford University Laboratory of Physiology placed at my disposal by Prof. E. G. T. Liddell.

EFFECTS OF DRINKING SMALL QUANTITIES OF SEA-WATER

AN EXPERIMENTAL STUDY

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DURING the last year work has been carried out in this laboratory, for the Medical Research Council's committee on the care of shipwrecked personnel (MRC War Memorandum No. 8), on the physiology of subjects receiving the same food and water as shipwrecked men in lifeboats.† A full report of all the work has been prepared and will be published elsewhere; in the meantime results and conclusions which have to do with the consumption of sea-water are presented here. In particular the effects of drinking sea-water upon the chloride balance, the urea excretion, the urinary output, and the body-weight losses of the shipwrecked man—called for short, the "man on the raft"—are considered in some detail. Some references to experiments in which salt water was not drunk are also made.

An extensive series of experiments has shown that a man requires between 800 c.cm. and 1000 c.cm. of water per day to satisfy all his requirements, the actual amount varying with the previous metabolic history of the subject, his activity and his diet during the experiment. With an intake less than this he contracts a "water debt" to his own tissues. It was found that a man in water debt continues to produce 350–450 c.cm. of urine per day. The same low output was found whether the water-debt was large or small and it was maintained throughout the longest experiments, which were for no water intake 4 days, and for limited water intake 10 days (1 day no water; 5 days 540 c.cm.; 4 days 60 c.cm. per day). During the period of low urinary output the urea concentration in the urine rose to as much as 6% but the total urea output was inadequate, and there was nitrogen-retention with a rise in blood-urea. At the same time salt losses in the urine were high on the first day, but they fell in a day or two to a low level. In all experiments the diet provided not more than 1 gramme of sodium chloride daily, but the excretion was greater than this, so there was always a slight negative salt-balance in those experiments where no sea-water or saline was drunk.

In addition to the physiological effects which are described later there was, under these experimental conditions, a definite psychological value in having the extra volume of fluid available for drinking, even though it was salt to taste. This was not only my personal

* Receiving a research grant from the Medical Research Council.

† The secretary, Dr. B. S. Platt, asks us to point out that the committee, in Memorandum No. 8, do *not* recommend the drinking of sea-water. In reaching this decision they took account of other relevant factors besides the evidence recorded in the present paper.—ED. L.

TABLE I—OUTLINE OF EXPERIMENTS

—		Experiment number: 1	2a	Control to 2a	2b	Control to 2b	3	4
Subjects		3	5	5	5	6	5	2
Waterless period. Days ..		1	1	1	1	1	1	1
Preliminary fresh water period	Days ..	0	0	..	0	..	5*	2
	Daily intake (c.cm.)	..	..	..	..	..	540*	370
Salt water drinking period (1)	Days ..	4½	5	5	5	5	..	3
	Daily fresh water intake (c.cm.)	240	540	540	540	540	..	240
	Daily salt water intake (c.cm.)	180†	180	0	180	0	..	400
	Daily sodium chloride intake (g.)	6·3	6·3	0	6·3	0	..	14
Salt water drinking period (2)	Days ..	..	4	4	4	4	4	1½
	Daily fresh water intake (c.cm.)	..	60	60	60	60	60	0
	Daily salt water intake (c.cm.)	..	0‡	180*	180	0	180	240
	Daily sodium chloride intake (g.)	..	0‡	6·3*	6·3	0	6·3	14

* The subjects in this control experiment had a sea-water supplement in the second period and formed experiment 3.
† Saline; in all other experiments sea-water was drunk.
‡ The subjects in experiment 2a had no sea-water in the second period and became a control group for 2b and 3.

experience but was confirmed by unsolicited statements from, and by careful interrogation of, the subjects.

EXPERIMENTAL PROCEDURE

Four experiments have been carried out, with subjects drinking salt water or saline while in water debt. Table I gives the plan of each experiment. In the first three experiments the subjects were observed for the 24 hours immediately before the experiment, when their food and water intake was still unrestricted. In all the experiments the food ingested was the "shipwreck diet"; this comprises 1 oz. each per day of: biscuits; sweetened condensed milk; butter, fat or margarine; and chocolate. In experiment 1, after an initial waterless day, three subjects, for 4½ days, drank each day 240 c.cm. of fresh water supplemented with 180 c.cm. of 3·5% sodium chloride solution. In experiment 2, ten subjects, again after an initial waterless day drank, each day for 5 days, 540 c.cm. of fresh water supplemented with 180 c.cm. of sea-water; these subjects were compared with a control group of eleven under exactly the same conditions but without the sea-water supplement. After the 5-day period with 540 c.cm. of fresh water daily the sea-water drinking subjects were divided into two groups; one group of five (2a) ceased having the sea-water supplement and had a further period of 4 days with only 60 c.cm. of fresh water daily; the other group (2b) for the same period also had their fresh water cut to 60 c.cm. per day, but continued with the sea-water supplement of 180 c.cm. All the members of the control group already mentioned had their water intake reduced after the initial period with 540 c.cm. per day, to 60 c.cm. per day for the last 4 days, and five of these subjects received a sea-water supplement during this time of 180 c.cm. per day, making experiment 3. In experiments 1, 2 and 3, involving seventeen different subjects (one subject took part in both experiments 1 and 2) the daily intake of sodium chloride was 6·3 g. The sea-water used contained only 3·2% of sodium chloride and not 3·5%, so the daily intake was fixed in practice by adjusting the actual salt content of the sea-water. In experiment 4 the subject who had been in both experiments 1 and 2 and another subject had, while on the shipwreck diet, first a control day with unlimited water, then a waterless day followed by 2 days with 370 c.cm. fresh water daily; for the next 3 days they received daily 240 c.cm. of fresh water with a sea-water supplement of 400 c.cm. and for the last 36 hours no fresh water at all but a total of 600 c.cm. of sea-water. Added sea-salts, obtained by evaporating a portion of the same sample of sea-water to dryness, brought the sodium chloride concentration in the sea-water up to 3·5%, and the daily intake of salt was therefore 14 g. for the last 4½ days.

RESULTS

Chloride balance.—In all four experiments there was a lag in the excretion of sodium chloride. For the first 24 hours or more after beginning to take the salt water there was little change in the volume of urine excretion, with no rise in the chloride concentration, and hence there was a chloride retention; then suddenly, within the space of a few hours there was a great rise in the chloride concentration of the urine, and some increase in the urine volume, though the rise in this was more gradual; thereafter there was a balance between daily chloride intake and daily chloride excretion. It was noticed that the chloride retained during the latent period between increased chloride intake and increased chloride excretion balanced the amount of chloride that had been lost in the preliminary period upon the shipwreck diet with no water or limited water intake. This is the first point of interest; its possible significance is discussed later.

Nitrogen retention and blood-urea.—The nitrogen retention varied according to the condition of the experiment. In expts. 1, 2a and 2b the blood-urea rose during the waterless day an average of 8 mg. per 100 c.cm.; on drinking saline or sea-water there was no further change in the blood-urea throughout the period of the experiment in 1 and 2a, and throughout the first period of 2b. In the control group to expt. 2 the average rise was 8·4 mg. during the waterless day, and the blood-urea rose no further during the period when the water intake was 540 c.cm. per day with no sea-water. At this level of fresh water intake, therefore, sea-water had no effect on nitrogen retention. In the second period of expt. 2b and in expt. 3 the blood-urea rose in the 4 day period an average of 9 mg. per 100 c.cm. of blood above its previous raised though constant level: but in the control group having the same amount of fresh water, and the same diet and activity, but no sea-water, the average rise was 17·5 mg. In expt. 4 the blood-urea,

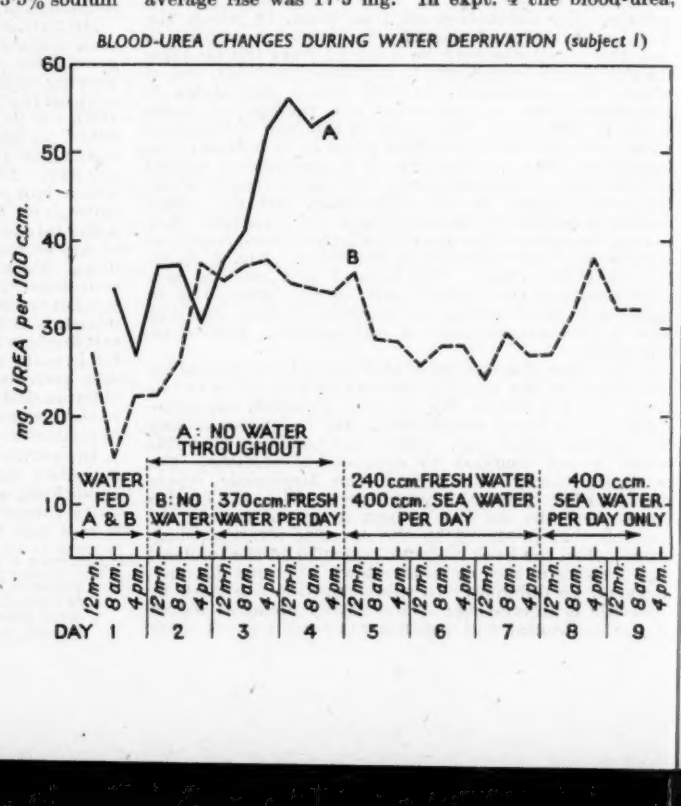

TABLE II—BLOOD AND URINE INVESTIGATIONS IN EXPERIMENT 4

Day of expt.	Conditions: shipwreck diet and		Subject 1						Subject 2					
			Urine			Blood-urea			Urine			Blood-urea		
	Fresh water (c.cm.)	Sea-water (c.cm.)	Vol. c.cm.	NaCl output g.	Urea output g.	Mid-night	8 AM	4 PM	Vol. c.cm.	NaCl output g.	Urea output g.	Mid-night	8 AM	4 PM
						mg. per 100 c.cm.						mg. per 100 c.cm.		
1	Unlimited	Nil	2260	8·55	25·78	29·2	19·5	16·8	2750	7·51	25·36	27·3	15·5	22·7
2	Nil	Nil	1567	2·65	13·09	12·9	28·0	28·6	1535	1·90	15·74	22·7	26·6	37·6
3	370	Nil	372	1·08	17·28	39·6	46·6	43·3	390	1·26	16·90	35·7	37·6	37·3
4	370	Nil	382	0·87	20·34	49·9	43·3	42·7	365	0·70	17·19	38·0	35·4	34·7
5	240	400	450	3·41	21·47	43·3	44·6	32·2	466	2·90	16·82	34·0	36·6	28·9
6	240	400	620	10·11	19·25	31·6	29·5	32·7	784	10·23	17·99	28·6	25·9	28·1
7	240	400	704	13·46	18·36	29·4	28·1	37·5	825	14·26	18·86	28·2	24·2	29·5
8	Nil	400	765	15·57	19·22	32·8	27·6	31·5	840	15·28	17·66	26·9	26·9	31·5
9 (half day)	Nil	200	442	9·88	8·59	35·5	34·5	..	438	8·69	10·05	38·1	32·1	..
9* (half day)	Unlimited	Nil	4031	17·88	39·37	..	..	24·3	1807	7·87	29·67	..	..	32·1
10* (half day)	..	..	..	..	..	31·5	30·2	..	..	..	..	36·1	23·6	..

* Second half of day 9, and first half of day 10 formed the rehydration period—unlimited food and water intake. Diet rich in protein.

raised during the waterless day, fell when the subject began to drink sea-water, to the pre-experimental level and remained there (see figure, curve B). The changes in the blood-urea may be of considerable importance; their mechanism will be discussed later.

Urinary excretion.—A diuresis occurred in all experiments in which sea-water or saline was drunk. No diuresis ever followed drinking fresh water in quantities insufficient to repay the water debt. The urine output was raised above the basic level of 350–450 c.cm. per day by an amount which was not, on the average, found to exceed the volume of the ingested saline or sea-water. In the first part of expt. 2, the average urine output was 534 c.cm. per day; in the control group, having the same diet, leading the same life, and drinking the same amount of fresh water but no sea-water, the average daily urine output was 412 c.cm. The diuresis did not in most cases equal in volume the volume of water that had been ingested as 3·5% saline or sea-water.

Table II summarises the results of expt. 4; in addition to the changes in the urinary excretions it also shows the blood changes. In this experiment 400 c.cm. of sea-water was drunk daily, at first with 240 c.cm. of fresh water, and later with no fresh water; because of this greater intake the diuresis was greater than in the other experiments. In all experiments the ingested chloride was entirely excreted after the initial retention, without interfering with urea excretion. In experiments 2 and 3 the total daily urea excretion was slightly greater than that of the control subjects not drinking sea-water but with the same limited intake of fresh water. Changes in the urea excretion were reflected by changes in the blood-urea. In expts. 1 and 2, when there was a relatively high fresh water intake with 180 c.cm. of sea-water per day, the blood-urea remained at a relatively low level. In the second period of expt. 2b and in expt. 3 the sea-water intake was still 180 c.cm. per day, but the fresh water was only 60 c.cm. per day; in these subjects the blood-urea rose, but less than in the control subjects. In expt. 4, with 400 c.cm. of sea-water daily, there was a fall in the blood-urea to the normal figure (see figure, curve B). The final effect, therefore, of the diuresis varies with the level of fresh water intake and the amount of sea-water taken; this point is further discussed below.

Body-weight.—The rate of weight loss was not much affected by drinking sea-water. The average weight loss of the subjects in expts. 2a and 2b, when they were drinking 540 c.cm. of fresh water and 180 c.cm. of sea-water per day, was the same as that of the subjects in the control group who had the same fresh water but no sea-water. In the second part of expts. 2b and 3, the daily fresh water intake was only 60 c.cm. but there was a sea-water supplement of 180 c.cm. per day; these subjects lost during the whole 4-day period an average of 3·90% of the initial body-weight for the 4-day period, while the average weight loss for the control subjects was 4·54%. In expt. 1, subject 1 was drinking 240 c.cm. of fresh water and 180 c.cm. of 3·5% sodium chloride each day; his rate of weight-loss in the experiment was definitely less than in a previous experiment when he drank the same amount of fresh water, ate substantially the same diet, but had no sea-water. No comparisons were available for expt. 4, but the body-weight curves of both subjects showed definite fluctuations at the time of the change from 370 c.cm. of fresh water daily to 240 c.cm. of fresh water with 400 c.cm. of sea-water; these fluctuations suggested a diminished rate of weight-loss when sea-water was drunk. No further discussion on this point is necessary.

DISCUSSION

From these experiments several important points emerge. The first is that the man on the raft, on the shipwreck diet, when he is not drinking sea-water is in negative chloride balance. If and when he begins to drink salt water, chloride is retained until the amount of chloride previously lost is made good. The initial loss of chloride from the body must result in an absolute salt deficiency; but, relative to the fluid content of the body, there is no actual salt deficiency during water deprivation. This is shown by the increase in the concentration of the sodium in the serum (my own observations; unpublished observations by McCance, 1943; Russel Elkinton and Taffel (1942), which indicates a general rise in the body osmotic pressure. Sodium chloride loss is generally associated with a loss of extracellular fluid. Wiley and Wiley (1933) from observations on the sodium and potassium losses in the urine deduced that the water lost early in water-deprivation is from extracellular sources, and that that lost later is mostly intracellular in origin. Russel Elkinton and Taffel fasted dogs completely (neither food nor water) for 12 days, making full metabolic studies. They confirmed on dogs Wiley and Wiley's observation on men, and also showed that the potassium losses were greater than the amount that would be made available from the tissue breakdown as indicated by nitrogen excretion. They calculated that more intracellular water was lost than could be accounted for osmotically and from tissue breakdown; it was found that 30–55% of the original intracellular water was lost, compared with only 20–38% of the extracellular water. They suggest that the tendency is for the body to conserve its extracellular fluid at the expense of the intracellular.

The restoration of the total sodium-chloride content of the body to its pre-experimental level seen in the present experiments may have been another manifestation of the same tendency. This relative retention of chlorides will give rise to an increase of osmotic pressure in the extracellular fluid. In consequence, water is immediately drawn out of the cells to restore the osmotic balance and thereby replenishes the depleted extracellular reservoir at the expense of the intracellular fluid. This must occur, but whether it is part of a protective mechanism or only a coincidence it is not possible to say from the present evidence.

The amount of sea-water allowed was calculated on the assumptions, first, that at low levels of intake at least 66% of the water ingested as sea-water is excreted as

urine additional to the basic output of 400 c.cm. per day; and second, that all the urine excreted under such circumstances can carry the maximum concentration of sodium chloride, that is, 2% (Davies et al. 1922). If x c.cm. of sea water are drunk or otherwise ingested the sodium chloride intake will be $35x$ mg.; the urine output will be $(400 + 0{\cdot}66x)$ c.cm. If there is to be no salt-retention then chloride output must equal chloride intake; if the urine contains the maximum amount of sodium chloride then at chloride balance

$$35x = (400 + 0{\cdot}66x)20$$

This gives an approximate value for x of 400. In practice it was found that with 400 c.cm. of sea-water per day more than 66% of its water content was lost in the urine. The maximum concentration of sodium chloride in the urine observed by Davies and his colleagues was confirmed; in experiment 4 the maximum chloride concentration in the urine of subject 2 was 2·00% and in the urine of subject 1, 2·30% of sodium chloride.

No references have been found in the literature to the physiological effects of drinking sea-water but the effect of rectal instillation has been examined in some detail. Experiments have been reported by Foy, Altmann and Kondi (1942) on this subject, and Bradish and his colleagues (1942) followed the effect of instillation of sea-water not only into the rectum but also up into the colon. The former workers gave repeated sea-water enemas to three subjects in the course of 80 hours during which they were deprived of water; on the first day as much as 1300 c.cm. were given, on the other days four enemas of 200 c.cm. each; a control group had no sea-water enemas and was totally deprived of water for the same period. In the sea-water group there was a 50% greater weight loss, less hæmoconcentration (the authors considered the hæmoconcentration the same in both groups, but the figures suggest otherwise), and—except for one man who had a gross rise—only a slightly greater rise in blood-chloride concentration. The latter workers, after "a condition of water deprivation was established" instilled 600 c.cm of sea-water into the rectum and colon of normal subjects and into the colon of a patient with a colostomy; in all subjects weight-loss was increased. In the patient, samples recovered from the colon at intervals showed a progressive dilution, and not all the chloride could be recovered at the end of the experiment. The conclusion was arrived at that the sea-water became diluted by osmotic absorption of body fluid, and that chloride was absorbed. Both groups of workers agree that sea-water per rectum during water deprivation accelerates the weight-loss, and increases the osmotic pressure of the body fluids because of chloride absorption.

In both the above investigations large volumes of sea-water were used over a short period; if smaller amounts had been used it is probable that different results would have been obtained. The kidney cannot excrete on an average more than 2% sodium chloride. Hence, if all the chloride is absorbed from the gut, and there is to be no chloride retained in the body, the volume of urine to be excreted must be at least 1·75 times the volume of sea-water ingested, taking sea-water as containing 3·5% sodium chloride. Therefore if 400 c.cm. of sea-water are absorbed per day the urine volume must be 700 c.cm., that is, 300 c.cm. above the basic urine level and giving a gain of 100 c.cm. of water; but with 800 c.cm. the urine volume must be at least 1400 c.cm., 1000 c.cm. above the basic level thereby resulting in a loss of 200 c.cm. of body water if all the salt is to be excreted. These calculations cannot be applied to the reported work on rectal instillation as the amounts absorbed were not recorded by these workers.

In regard to nitrogen-retention there are three different conditions to be discussed: complete deprivation of water; partial deprivation of water; and the ingestion of sea-water with or without small quantities of fresh water.

During complete water deprivation the total volume of body fluid is decreased, hence unless urea excretion is increased the concentration of urea in the body will rise. In addition the man on the raft is on a low calorie diet, so he has an increased tissue breakdown and increased urea production. Unless the clearance of urea increases therefore the urea concentration will rise. The total clearance depends on the concentration of urea in the urine; this is governed by the urea concentration in the plasma. As the concentration in the body fluids, and hence in the plasma, rises the concentration in the urine also rises, so that the ratio between urine-urea and plasma-urea concentrations (the U/P ratio) remains about the same. In this way the rate of rise in concentration of urea in the body fluids is kept in check and the concentration itself, as reflected by the plasma-urea rises only slowly. When, however, the ceiling concentration for urea in the urine is reached, further rises in plasma-urea concentration can no longer be followed by rises in urine-urea concentration; the U/P ratio falls but the urine volume is unchanged and so the plasma clearance is diminished and the concentration of urea in the body then rises more rapidly (see figure, curve A).

When only a little water is drunk, the drain on the body fluids is diminished, therefore the potential rise in the urea concentration of the body fluids is less. The amount of urea that has to be excreted in order to prevent this rise in concentration is correspondingly smaller, and this level of excretion can be achieved at a concentration of urea in the urine at or below the ceiling. This urea concentration is attained with a normal U/P ratio and only a slightly raised level of urea in the plasma; the plasma-urea remains steady at this slightly increased level (see figure, curve B).

When sea-water alone is drunk the urine volume rises; if the U/P ratio remains high the clearance is increased. With 180 c.cm. of sea-water daily and very small quantities of fresh water (expt. 2b and expt. 3) the blood-urea still rose, though the average urea output per day was 1 g. greater than in the control group who had no sea-water. This difference in output was reflected by the lower blood-urea levels in the subjects drinking sea-water. With 400 c.cm. of sea-water and 240 c.cm. of fresh water per day the increased urine output permitted such a good clearance that a raised blood-urea was brought back to the pre-experimental level; and when the fresh water was discontinued there was only a slight increase in the blood-urea (see figure, curve B). Drinking sea-water, therefore, in these quantities diminishes or prevents nitrogen retention and possibly to this extent may benefit the man on the raft.

SUMMARY

The effects of drinking up to 400 c.cm. of sea-water daily, when either totally or partially deprived of fresh water, and on the low-calorie and low-salt diet of the "man on the raft" may be summarised as follows:

An increase in urine output, with an improved total urea-clearance;

A slight gain to the body of water, because the extra water lost in the urine is less than the extra water ingested as sea-water;

An initial retention of chloride equal to the chloride lost before beginning to drink the sea-water; and subsequently full excretion of all the chloride ingested.

I wish to thank the Medical Director-General of the Navy for permission to carry out the large scale experiments at a Royal Naval Hospital, and the Surgeon Rear-Admiral commanding the hospital for the facilities extended to me there. I wish to express appreciation to the subjects who voluntarily underwent the rigorous conditions of the experiments, and to the laboratory and clinical staff without whose help much would have been left undone. I must also thank Dr. B. S. Platt and Dr. E. A. Carmichael for their encouragement.

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LCC NURSERIES.—During the past year admissions to the Council's four London nurseries have nearly doubled and at present over 70 babies a week are being admitted. It is no longer possible to send enough children to short-stay nurseries in the reception areas to keep vacant cots in London for day-to-day needs. The Council is therefore opening a new nursery in Maitland Park Road, N.W.3, which will accommodate 36 babies.

PNEUMONITIS ASSOCIATED WITH AUTOHÆMAGGLUTINATION *

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WHILE investigating a case of fever, we observed that, when a drop of blood was placed on a slide, the red corpuscles immediately separated into clumps. Furthermore, when an attempt was made to count them, they were agglutinated in the diluting chamber of the hæmocytometer pipette. In this patient, apart from the fever, the only clinical findings were moist sounds at the bases of the lungs. His illness appeared similar to that of other patients with fever and cough then under our care. Their blood was accordingly examined, and was found to show clumping of red cells in varying degree. An investigation in the medical wards led to the recognition of a group of cases in which the predominant clinical features, all of gradual onset, were fever and cough, the latter often associated with vomiting, hoarseness of voice, and the presence of fine crepitations in the lungs: all showed the phenomenon of agglutination of red corpuscles.

The following observations are based on 54 consecutive cases of this form of pneumonitis, of which 50 came from two companies of the Royal Indian Army Service Corps, which had recently arrived from India together, and the remaining 4 were in other RIASC sepoys, who had had an opportunity to mix with these companies at the nearby training centre. The men had been recruited six months previously in the Delhi-Meerut-Lucknow area. They had been in camp near Delhi, where the incidence of fresh malarial attacks was high, and some of them were still suffering from the effects of this disease. Admissions with symptoms attributable to pneumonitis began shortly after arrival in the Middle East:—

Weeks after arrival	1	2	3	4	5	6	7
Cases admitted	4	10	8	13	5	9	5

The principal incidence was in December, when the nights were cold, the days warm and sunny and the atmosphere dry. There was no unusual incidence of catarrhal infections of the respiratory tract either in these two companies or among other Indian troops in the locality.

CLINICAL FEATURES

The cases may conveniently be divided into four groups: (i) atypical pneumonia; (ii) short fever with cough and persistent lung signs; (iii) afebrile laryngitis with little or no lung involvement; and (iv) proved malaria or splenomegaly with laryngeal or lung affection.

Group I.—The 13 sepoys in this group had a severe febrile illness lasting six days or more.

The fever usually exhibited a daily swing from normal to as high as 104° F. In 7 patients, after the initial bout of fever, there was a relapse which in some cases was more severe than the original attack. In 2 patients there were repeated relapses, and they were febrile for 31 and 46 days. Sulphapyridine was given in 7 cases; in 2 the fever was completely suppressed and in the remaining 5 there was partial suppression followed by recrudescence on withdrawal of the drug. Cough was persistent and was associated with vomiting in 5 cases. Laryngitis was conspicuous in 6. Dyspnœa out of all proportion to the physical signs in the lungs was noted in 3 cases, but in only 1 of these was there cyanosis. The nasopharynx was congested in 2 cases only.

The most frequent findings in the lungs were fine moist sounds, usually at the bases and axillæ but sometimes in other localities such as the sub-apex. These crepitations sometimes persisted as long as three weeks after the fever had subsided. The percussion note was impaired over the affected areas but there was never bronchial breathing or other evidence of classical consolidation. The sputum was characteristically copious, frothy, and mucopurulent with occasional flecks of blood. All these patients were radiographed by Major G. A. Maddocks, RAMC, and in 9 of them the X-ray appearances indicated parenchymatous lesions in the lungs, more extensive than the physical signs suggested.

No skin rashes were observed and no enlargement of lymph-glands. Neurological features were absent and the cardiovascular system was little affected. The urine contained no albumin or sugar and negligible deposits. The liver was not enlarged, and though the spleen was moderately enlarged in 3 cases, it was hard, and its condition could be attributed to previous malarial infection. Repeated blood smears failed to reveal malarial parasites or spirochætes. All the patients recovered and were sent to a convalescent depot after 4–10 weeks in hospital.

At the time these patients were in hospital, the only laboratory equipment immediately available was a microscope and a hæmocytometer; so specimens for bacteriological examination had to be sent several miles to a laboratory already busy with other routine work. Blood cultures (in 8 cases) were sterile; sputum cultures (3 cases) showed no constant or significant organism; and lung puncture (3 cases) yielded no pathogens. The Weil-Felix reaction was negative with OX19, OXK and OX2 antigens in 8 cases. The Kahn was negative in 5 patients tested.

Of the 13 patients 9 showed a leucocytosis, which varied from 12,000 to 61,000. The polymorphs never exceeded 88%, but there was a well-marked shift to the left and in 2 cases definite myelocytes were seen in the peripheral blood. In 5 of the patients there was a mononucleosis, which in one case was as high as 16% of 22,000 cells. In another man there was a notable lymphocytosis. Thus the differential blood-picture was by no means uniform.

Autohæmagglutination was exceptionally rapid in 3 of the cases. In 2 it was initially impossible to do a blood-count. In the third an independent observer, in the course of routine blood-grouping, reported complete agglutination on the wire loop which he was employing to transfer blood from the finger to the serum.

Group II.—This group comprises 15 sepoys with a mild febrile illness of less than six days.

All showed cough and basal crepitations and in some instances these persisted a fortnight after the fever subsided. In 7 cases there was laryngitis, and in 6 vomiting with the cough. Sputum resembled that in group I. The nasopharynx was congested in only 2 cases; there were no positive X-ray findings. The spleen was enlarged and hard in 6 patients, but blood examination revealed no malarial parasites or spirochætes. In 5 there was a mild leucocytosis.

Group III.—In this group we include 12 cases of laryngitis. They were afebrile in hospital but 9 gave a history of fever just before admission.

Only 2 showed any congestion or œdema of the pharynx but in 7 a few crepitations were found at the bases of the lungs. All 12 patients had cough and 5 had vomiting. Capt. Sanjiva Rao, IMS, who kindly examined several of the patients, reported some œdema and congestion of the larynx but no ulceration. The laryngitis usually persisted for 2–3 weeks. In 6 cases there was a hard palpable spleen, but again no blood parasites were found.

Group IV.—The remaining 14 patients comprise 9 in whom malarial parasites were found in the blood and 5 in whom the spleen was much enlarged.

All of them presented respiratory features: 13 had persistent crepitations in the lungs, not necessarily basal, and 6 had laryngitis; rhonchi was noted in 4 cases only. The throat was innocuous in all. The fever was variable and responded to quinine, although in 3 instances there was a short recrudescence of pyrexia on withdrawal of the drug.

AUTOHÆMAGGLUTINATION

Autohæmagglutination is defined by Boxwell and Bigger (1931) as "a clumping of erythrocytes into irregular masses, visible to the naked eye, occurring in the presence of the individual's own serum, without bacterial action, at air temperature, and reversible at body temperature." In this paper we restrict the term to the separation, within two minutes and in the midst of a clear plasma, of clumps of erythrocytes, readily visible to the naked eye. No incubator was

* This paper, dated Feb. 8, 1943, reached us at the beginning of July, when we had already published the observations of Lieut.-Colonel J. C. Turner and his colleagues on the Relation of Cold Agglutinins to Atypical Pneumonia (*Lancet*, 1943, i, 765, 779). To facilitate early publication it has been much abridged.—ED. L.

available to study the critical temperature at which this change occurred, but there seems little reason to doubt that it was at or about body temperature.

To determine whether the agglutination was due to a peculiarity of the red cells or of the serum, in 30 cases serum and cells were separated and the former tested against accredited O (IV) corpuscles. On every occasion agglutination took place. Two sera were tested and found to agglutinate rabbit and sheep cells in addition. It can therefore be assumed that in our series the phenomenon was attributable to the presence of a non-specific agglutinin in the sera, capable of agglutinating any red corpuscles. Coincidently with the clinical improvement, the rate of agglutination and the size of the aggregates were gradually diminished. On discharge from hospital the majority of the patients still showed some pathological clumping, but in about a third it no longer occurred.

A study of the available literature showed that autohæmagglutination was reputed to be rare. It has been reported in a variety of diseases—notably affections of the liver and spleen, severe anæmias and chronic sepsis—and occasionally in normal people (Boxwell and Bigger 1931, Whitby 1942). The only disease in which autohæmagglutination is claimed to be almost constant is trypanosomiasis and Yorke (1911) found it in animals with trypanosome infection. Manson-Bahr (1935) states that it is often noted in kala-azar.

We have sought for autohæmagglutination in 331 sepoys other than those with pneumonitis, and the results are summarised in the accompanying table. In the cases recorded as positive, the agglutination was similar to that seen in the pneumonitis series but it was seldom so coarse or so rapid. We have not seen more than a fine granularity in the blood of a healthy person, and apart from the afebrile members of our series, we have not found agglutination except in patients suffering from some serious ailment, usually of an infective nature. In these the phenomenon appears to be by no means uncommon, which is not altogether unexpected since in these diseases the erythrocyte sedimentation-rate is often accelerated. The high incidence in cases of chronic malaria is interesting and suggests further inquiry.

INCIDENCE OF AUTOHÆMAGGLUTINATION IN 331 SEPOYS

—	Number tested	Autohæmagglutination present
Chronic malaria (splenomegaly, malarial anæmia and febrile relapses)	37	20
Miscellaneous, acute and chronic respiratory infections	41	2
Tuberculosis {pulmonary	46	10
Tuberculosis {non-pulmonary	5	2
Infective hepatitis	8	2
Nephritis	3	1*
Leprosy {nodular	1	1
Leprosy {anæsthetic	5	0
Severe battle casualties	35	7†
Miscellaneous non-septic surgical	42	0
„ afebrile medical	48	0
Healthy sepoys	60	0

* Severely anæmic. † All with chronic sepsis.

DISCUSSION

There can be no question that the illness attacking our 54 patients was an infection, usually involving the parenchyma of the lung. It is reasonable to describe the disease as a pneumonitis and to regard the cases as a graduated series, at one end of which the lung features were so mild that no clinical signs were observed after admission of the patients to hospital. Indeed, these latter cases may be considered a *forme fruste* of the infection.

Pneumonitis or atypical pneumonia is, in our experience, not at all uncommon among Indian troops in the Middle East, but we have never previously seen so many cases in one unit within so short a time. In an annotation on the rickettsias, the *Lancet* (1941) states that "recent observations suggest that many rickettsial infections involve the lungs, setting up a pneumonitis or interstitial pneumonia," and it is therefore relevant that all the patients examined were heavily infested with lice, as indeed were all the men in the two companies involved. The association of chronic malaria with so many of the cases must suggest the possibility of a malarial basis for the disease, but an outbreak of malarial pneumonitis is outside all previous experience. In these circumstances the nature of the infective agent, with its peculiar affinity for the lungs and the larynx, remains a matter for speculation.

SUMMARY

An outbreak of pneumonitis in an Indian unit is described. Autohæmagglutination was found in all 54 cases.

Our thanks are due to Lieut.-Colonel P. A. Dargan, IMS, for permission to publish this paper and to Jemadar M. Bhattacharya, IMD, for his assistance.

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URINARY TRACT INFECTIONS IN THE ROYAL NAVY

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IMPRESSIONS of the incidence of given diseases in the Forces in war-time as compared with their incidence in normal civilian practice are apt to be ill-founded, because a picked and normally healthy population of a particular age-group is under observation. Only members of the same branch of the Service in the prewar years can offer a true basis of comparison; and using these as controls it is also possible to assess the influence of war conditions on the trend of a disorder. In a review of ailments in naval personnel admitted into an EMS hospital in 1942, urinary infections seemed surprisingly prominent. It was possible to confirm this impression by comparison with data in the Statistical Report of the Health of the Royal Navy for past years. The year 1935 was chosen merely because it is relatively recent.

At that time the Navy carried a force of 86,343, and the number of cases in the sick-list was 37,963. Infections of the urinary tract grouped under various headings—cystitis (60), pyelitis (39), bacilluria (12), pyonephrosis (3), trigonitis (1), pyuria (1)—formed a total of 116 cases; this works out at about 3 per 1000 of sick cases, and 1·34 per 1000 of total strength. The number of Naval admissions in 1942 into the EMS hospital was 5093, and of these, 172 were found to be suffering from an infection of the urinary tract—an average of 33·75 per 1000 admissions, or more than 11 times the prewar incidence.

It is interesting to contrast the figures of the Royal Air Force (Rook 1938). Between the years 1926 and 1936, the yearly average was 1 case of pyelitis or cystitis per 1000 strength. Rook divided his series into two groups according to whether the affected person was stationed in the United Kingdom or serving abroad: the incidence in the latter was 1·7 cases per 1000, and in the former 0·7; so that service abroad seems to be an important ætiological factor. A further deduction which can safely be drawn from the relative small difference between prewar incidence in the RAF and in the Navy is that conditions in the Navy in peace-time do not favour any increase of infections of the urinary tract: the great increase encountered can only be attributed to the abnormal conditions of war.

Of the 5093 admissions to the EMS hospital, 485 were officers, 213 WRNS and 4395 ratings; and among these, 11, 18 and 143 cases of urinary infection were found. An incidence of 84·5 per 1000 sick cases is obtained for the WRNS, but this cannot be regarded as having weighted the average figure unduly, for even when the female section is excluded, the rate works out at about 32 cases per 1000. No parallel figures are avail-

able to show the trend of urinary infections in the WRNS as compared with those in the female adult population of peace-time.

The onset was nearly always acute, with malaise, anorexia and general aching of the body, so that often the diagnosis was mistaken. Pyrexia was commonly present, lasting as a rule only two or three days. A history of rigor was obtained in only a few instances, but the patients often complained of feeling cold and shivery. Gastro-intestinal symptoms were not conspicuous, though there were diarrhœa and nausea in a few cases; constipation was not more prominent than in other admissions to hospital. Frequency of micturition was by far the commonest symptom, and definitely indicated the diagnosis; but the patient seldom volunteered information about frequency spontaneously, and direct questioning was necessary. Pain, when present, was situated over one or more of the recognised sites—the lumbar region posteriorly, along the lines of the ureters, the hypogastrium, and along the urethra during micturition. In nearly all cases tenderness was found over some area of the genito-urinary tract, even when spontaneous pain was absent. All cases recovered, and no complications were encountered if one excludes acute non-specific epididymo-orchitis, seen in 8 patients. It is debatable whether this condition can definitely be ascribed to the urinary infection, since in some cases of the kind no urinary infection or other ætiological agent could be demonstrated.

The first 100 cases of urinary infections were compared, as regards previous attacks of gonorrhœa, with a similar number of consecutive admissions to the medical wards at various periods of the year; no evidence was found to suggest that gonococcal infection bore any definite relation to the malady. Urinary infection developed in some patients while they were being treated in the wards for some other condition.

Symptomatology in the WRNS differed somewhat from that among the men; the onset was more insidious, systemic reactions were not pronounced and the stay in hospital was longer. The attack was the first in nearly all the men, but among the WRNS a history of a previous bout was not uncommon. In 172 cases the incidence of various symptoms was as follows: frequency of micturition 130; backache 62; pain in right loin 36; pain in left loin 30; pain in hypogastrium 15; painful micturition 35.

In 56 cases another malady coexisted, but there was no significant correlation with any particular disease. The associated conditions were: anxiety state 9; bronchitis 5; cellulitis of ear 1; duodenal ulcer 3; dysentery 1; epididymo-orchitis 8; gastritis 5; glandular fever 2; gonococcal arthritis 1; hæmorrhoids 1; hyperpiesia 1; infective hepatitis 2; malaria 2; nephrectomy 1; papilloma of bladder 1; pregnancy 1; prostatitis 1; renal calulus 5; and tabes dorsalis 1.

To assess the possible influence of seasonal variations on the incidence of urinary infections in this series, it would be necessary to know the weather conditions prevailing at sea or port of debarkation at the time of onset. This information could not be collected but the number of cases admitted to hospital in each month of the year are noted in table I. It will be seen that there is a fairly even distribution throughout the twelve months.

TABLE I—CASES OF URINARY INFECTION ADMITTED IN EACH MONTH OF 1942

	Cases		Cases		Cases		Cases
Jan.	8	April	12	July	17	Oct.	19
Feb.	15	May	16	Aug.	14	Nov.	13
March	13	June	18	Sept.	10	Dec.	17

The largest number of cases fell within the 20–30 decade (table II), but this may merely reflect the larger number of personnel of this age-group at present serving in the Navy.

TABLE II—AGE-GROUPS OF PATIENTS WITH URINARY INFECTION

Age (years)	Ratings	WRNS	Officers
17–20	18	7	1
20–30	68	9	6
30–40	39	2	2
40–50	18	0	2

Hammond (1935) considers that, with men, a catheter specimen of urine is unnecessary for bacteriological examination. Midstream specimens of urine were therefore regarded as satisfactory from men, while women were catheterised. A few staphylococci or coliform organisms were taken to be due to contamination, but when any doubt existed, a catheter was passed. By far the most common offending organism was *Bacillus coli*. No attempt was made to classify the coliform bacilli into the groups suggested by Hill, Seidman, Stadmichenko and Ellis (1929). Staphylococci were found in very few cases, and these were nearly all WRNS. *Streptococcus fæcalis* was the sole infecting organism in 28, while a mixed infection of *S. fæcalis* and *B. coli* was found in 19. In several patients the flora of the urine was seen to change during treatment from *B. coli* to *S. fæcalis*, or vice versa.

Microscopy of urinary sediment revealed a variable number of pus cells, and in men spermatozoa were not uncommon. Cells derived from the lining of the urinary tract were often seen. Albuminuria was present in some 50 cases, but was rarely considerable, and only persisted for a few days. Frank hæmaturia was found in 16 cases, and even when the results of chemical tests for blood were negative, a few red cells were often reported on microscopy. The sediment was usually mucopurulent, but only during the first few days. An offensive urinary odour was rare.

Treatment was by rest in bed, forced fluids and a citrate and bicarbonate alkaline mixture, given at two-hourly intervals until the reaction of the urine was alkaline, and then reduced to four-hourly dosage. Results were good and the urine was usually sterile within two weeks. Rest in bed and the large intake of fluid were probably the important factors, and contributed to the good results. Subjective symptoms disappeared within 3–4 days. A small number of cases were resistant; the usual course then was to give ammonium chloride in sufficient dosage to render the urine acid, and a hexamine mixture. If these failed, a return to alkaline therapy nearly always succeeded. Mandelic acid preparations were also efficacious. The value of sulphonamides in urinary infections has become firmly established; they were not often employed in this series and no attempts at comparison of their efficacy were made. Infections in WRNS were more resistant to treatment of all types, and required a longer stay in hospital than infections in men.

DISCUSSION

The mode of invasion of the urinary tract by infection is still unsettled. The three routes—hæmatogenous, lymphatic and ascending—all have their protagonists. A noteworthy feature in this series was the sharp onset with fairly severe constitutional disturbance, suggesting a systemic infection or toxæmia. No blood-cultures were examined to establish the possibility of a blood-borne infection, but it is now generally accepted that in so-called normal subjects organisms periodically gain access to the blood. These organisms may be destroyed in the blood-stream, but if not, the kidneys offer the natural channel for their elimination, and this is the course of events surmised by many in the ætiology of pyelitis. The urethra offers a site from which, after but slight trauma, organisms are rapidly absorbed into the blood. The question of masturbation and the resulting injury of the urethra, the proximity of the rectum, contamination of the fingers and the lack of preputial toilet forms an interesting chain of circumstantial evidence. Even the change of type of infecting organism seen in several of the cases could be explained by a subsequent bacteræmia. It may be argued, however, that the inflammatory swelling and spasm of the ureters partially obstruct the urinary flow, and account for the generalised symptoms at the onset of the illness. Furthermore Helmholtz (1937) has shown that injection of *B. coli* into the blood-stream, even when the kidney has been damaged, does not necessarily produce urinary infection. It is also difficult to explain cases of septicæmia from organisms other than those usually isolated from infections of the urinary tract; in these a true inflammation of the tract does not occur; does the nephron exert any selective action in the elimination of different types of bacteria?

Rook refers to the experiments of MacKenzie and Wallace (1935) who injected dyes into the lower parts of the urinary tract. It was found that in every case the dye passed to the lymphatic chains running up along the aorta, and in no instance could the dye be found passing up the ureteral wall or the peri-ureteral lymphatics. The lymphatic route, however, may operate indirectly, conducting the organisms to the blood, and thence arriving at the kidney.

The greater liability of women to these affections is in favour of ascending infection, and has been explained in terms of the shorter length of the female urethra. Men were asked their own views of contributing factors. Some mentioned that owing to the special nature of their duties they were only able to empty their bladder at long intervals; and strenuous work might have to be done with the bladder distended. This would increase intravesical pressure, and possibly have secondary effects upon the ureters. Stagnation may also play its part. Learmonth (1937) considers that ascending infection by way of the ureter is the most probable hypothesis.

Hammond points out that whatever route the organisms travel along, they always seem to come from the intestines, and he stresses the importance of the hyposthenic constitution. Coli infections, he says, are not common in strong and robust people, and when they do occur, there is some lowering of vitality through long physical or mental fatigue. I have been struck by the tired and anxious appearance of many of the men admitted during the year under survey, and have noticed how quickly their general health responds to rest in hospital. It may be that this state of fatigue predisposes to infection. The urinary tract was fully investigated in only a few cases, but it is unlikely that organic disease of this system was present in large numbers of these patients, all of whom had previously been healthy and recovered quickly from their illness.

SUMMARY

Infections of the urinary tract in the Royal Navy are common.

Men of age-groups (20–30) not ordinarily considered liable to this disease formed the bulk of the cases reported here.

The onset was acute, with constitutional upset lasting a few days, and cure followed simple therapy, usually within two weeks.

No complications were recorded, no definite ætiology was ascertained and no prophylaxis can be advocated except avoidance of over-distension of the bladder.

Coliform organisms were isolated from the urine in most instances.

Age and the particular season of the year in this country did not appear to have any influence on the incidence.

I have to thank Temporary Surgeon Rear-Admiral J. W. McNee, Dr. J. A. Wilson and Dr. A. M. Scott for their kind help, my surgical colleagues for access to their case-records, and the Medical Director-General of the Navy for permission to publish this paper.

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Reviews of Books

Queen Charlotte's Textbook of Obstetrics

(6th ed.) By the members of the clinical staff of the hospital. (Churchill. Pp. 577. 25*s*.)

THE new edition of this popular textbook is arranged like its predecessors. It has been altered, however, to bring the text into line with modern methods, and a small section has been added on postnatal care. The clinical staff of the hospital, with four specialists in subjects allied to clinical obstetrics, have presented in a clear and readable form the current practices of our senior lying-in hospital. The section on development is notably good, and that on puerperal pyrexia should be read especially by those responsible for institutional midwifery. Early rotation of complicated occipito-posterior cases is advised, but it is perhaps disappointing that the authors do not consider this best achieved by seeking the posterior shoulder and leaving the head to look after itself. Compression of the fœtal head during repeated attempts to rotate a difficult case may be harmful, but manipulation of the shoulder involves no such danger. The view that the breech with extended legs has a worse prognosis than the other varieties will not be universally accepted. The section on the pelvis perhaps emphasises too much the average measurements without mentioning the equally important standard deviations. The section on forceps is not well illustrated. Apart from such minor shortcomings, the book contains all the information that the medical student and recent graduate require for a sound working knowledge of obstetrics.

Synopsis of Surgical Anatomy

(5th ed.) ALEXANDER LEE MCGREGOR, M CH EDIN., FRCS. (Wright. Pp. 710. 25*s*).

THE few minor changes which have been made in this book since it first appeared speak well for its conception and execution. Developments of surgery requiring extensive knowledge of anatomy have caused Mr. McGregor to add a full account of the latest views on the anatomy and physiology of the automonic nervous system. In this field the anatomist and physiologist have followed the experimental surgeon. The author has extracted the essentials of Codman's work on the shoulder, and ably described the anatomy of the various injuries of this region, using his own cases to illustrate clinical points. These two sections, with a short and rather incomplete account of the anatomy and pathology of the intervertebral disc, comprise the main additions. The excellent diagrams are still a feature of the book, which though not for the tyro (being written in tabulated form) should certainly form part of the library of the candidate for higher degrees and of the professional surgeon.

Annual Review of Physiology

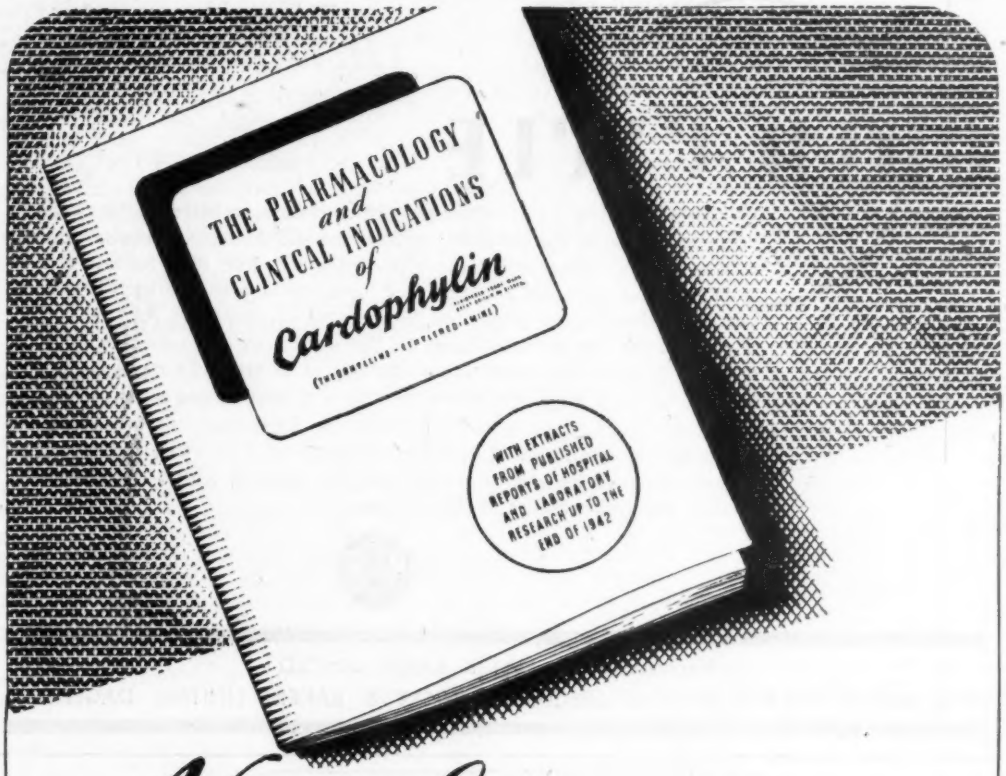
Editors: J. M. LUCK, V. E. HALL, Stanford University. (Lewis. Pp. 613. 31*s*. 6*d*.)

WE commend the decision of C. V. Taylor, one of the contributors to this annual digest of new knowledge, "to find a theme which might not only represent some present research trends but also help tie together the reviewed accounts, even at the risk of some serious omissions." The reviews written in this way, as in previous volumes, make better reading than the other contributions, but they are all valuable, and the editors may well be thanked for maintaining this service to medical science in spite of the increasing difficulty of obtaining journals and contributors from abroad. The growing tendency of reviewers to write in a readable and explanatory way is satisfying, and the editors show no signs of stereotyping their table of contents. Subjects earning for the first time an article to themselves are the physiology of bone, nerve and synaptic transmission, and biological assay.

Ambulance Hand Book

(14th ed.) E. G. GERSTENBERG, FRCSE, FRFPSG; J. B. GAYLOR, FRFPSG, W. C. GUNN, MD. (St. Andrew's Ambulance Association. Pp. 432. 2*s*. 6*d*.)

THIS book on the principles of first-aid to the injured has reached the impressive total of 14 editions since 1933, and its popularity is justified. No concession is made to the relatively illiterate, and the style is reminiscent of the rolling periods of Sir Walter Scott. The preface says: "St. Andrew's Ambulance Association still adheres to the principle that in order to practise ambulance work, a knowledge of the human frame and of the nature of life is fundamental. For this reason anatomy and physiology are dealt with in considerable detail so that the advanced pupil may be able to understand the principles which govern the practice of first aid." The aim is fulfilled though with a greater use of anatomical and other technical terms than is usually found in first-aid books. The illustrations, especially the photographic plates, are very good.



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THE LANCET

LONDON: SATURDAY, OCTOBER 9, 1943

FATE OF SKIN HOMOPLASTS

GRAFTS from a patient's own skin, it is fairly generally agreed, will survive under favourable conditions to cover a denuded surface, while those from another person will not. Skin from a stranger will persist for a time, but finally and with few exceptions will be cast off. An explanation widely accepted is that the donor's epithelium is treated by the host as a foreign protein: it provokes an antibody which is able to destroy it. A regular exception to this rule is, significantly, the permanence of grafts between monozygotic twins. Similarity of blood antigen between recipient and donor, however, carries no assurance that a graft will be acceptable. The theory that the epithelium of another person gives rise to damaging or destructive antibodies in the plasma and fluids of the host is derived from serological and immunological knowledge in general. The possibility that blood and connective-tissue cells share in the rejection of foreign tissues and cells, either directly or through the intervention of opsonins, has never been excluded. The opportunity to test this second possibility has been seized by GIBSON and MEDAWAR [1] with the coöperation of a patient suffering from a large denuded burnt area of skin. The wounded area was put at rest, and kept suitably covered and bacteriologically clean; only *B. proteus* was ever grown from it. Transplantation on to the surface avoids almost entirely any foreign body reaction due solely to insolubility—such, for example, as fat and keratin are likely to provoke. There was some evidence of this kind of reaction but figs. 7 and 24 suggest that polymorphism of epithelial cells may have been mistaken for a foreign-body giant-cell reaction. Part of the denuded surface was grafted with autoplasts, part with homoplasts from a relative, and yet a third area with a second set of homoplasts from the same relative 15 days later. GIBSON and MEDAWAR then removed one graft with its bed from each of the first two sets at intervals of 5, 10, 15, 23, 31 and 36 days, for histological examination and comparison. According to expectation the autoplasts spread and became part of the new epithelial covering while the first set of homoplasts, after a good start which included vascularisation, began to degenerate between the 10th and 15th days, and by the 23rd day the epithelium was completely detached. In the second set of homoplasts, degeneration was complete by the 8th day after grafting—that is, simultaneously with the first set. Detailed cytological study revealed a quantitative but no qualitative difference between the local cell reaction of blood and mesenchyme cells. No evidence of epithelial destruction by phagocytosis was found. The first anatomical sign of rejection of the homoplasts was a separation at the dermo-epidermal junction in the donor's graft. This is the point where a separation in healthy skin is so difficult to achieve. By dissection it is almost impossible. It can be achieved by autolysis, by digestion for 24 hours in 1% acetic acid and very neatly at times by electric shock. Once the grafts had separated, the epithelium, which is parasitic upon the dermis, began to degenerate from the deepest cells progressively outwards, and was finally cast off. The fate of collagen in the graft was less certain. At a very late date it was found in one patient to have been phagocytosed in small globules. In another it appeared to fade away.

The simultaneous rejection of the first and second set of homoplasts, which had previously been observed by GIBSON in another case, provides one of the best pieces of evidence yet offered for the immunological explanation of failure of these grafts. It seems highly probable that the first set, grafted 15 days earlier, stimulated an antibody which was then available in the circulation to destroy the second at the same time. According to serological theory this antibody might be a lysin or variety of lysins; from the observations recorded, perhaps the dermo-epidermal junction is most readily, and collagen least readily, dissolved or broken up, thus accounting for the success of many corneal homografts. Only by following the progress of homoplasts by examination at frequent intervals from the earliest days can certain knowledge of their fate be obtained. Misleading impressions may otherwise arise. Even now many gaps in our knowledge remain and it is to be hoped that a few more human volunteers will be forthcoming to extend and confirm what has been found. It is important to know why more plasma cells, lymphocytes and polymorphs attend the homoplasts than the autoplasts; and whether, perhaps, these cells prepare the way for eventual ingestion of the collagen. MEDAWAR has discussed other problems in a practical article.[2]

Though multiplication of cells is assumed GIBSON and MEDAWAR make no reference to cell division. Whereabouts in the graft are mitoses to be found, if at all? Or is the whole spread due to migration of cells? If mitotic division occurs within the graft at a distance from its migrating edge, as in the case of a wound, was any support found for the suggestion of WIGGLESWORTH [3] that it was due to cell sparseness inside the expanding graft? Does the graft in fact function in just the same way as healing skin which has not been transplanted?

1. Gibson, T. and Medawar, P. B. *J. Anat.* 1943, **77**, 299.

COUP AND CONTRECOUP

SURGEONS have long taken a keen interest in the effects of injury to the head and have tried to explain what they have observed during life and after death; but the variety of these explanations bears witness to their foundation upon supposition rather than fact. DENNY BROWN and RITCHIE RUSSELL have supplied accurate information about the results of certain forces applied to the head when fixed or free to move under experimental conditions; the purely physical study of the behaviour of the skull and brain during and immediately after a blow remains to be worked out. HOLBOURN, whose study of the mechanics of head injuries appears on another page, starts from the known physical properties of skull and brain; using models consisting of a gelatin "brain" inside a paraffin-wax "skull" he has analysed the forces

2. Medawar, P. B. *Bull. War Med.* 1943, **4**, 1.
3. Wigglesworth, V. B. *J. exp. Biol.* 1937, **14**, 364.

which could result in cerebral injury. His main contention is that shearing strain—"the type of deformation which occurs in a pack of cards when it is deformed from a neat rectangular pile into an oblique-angled pile"—is the chief agent, and he proceeds to explain how this shear (or slide) may be developed in the brain as the result of blows upon the head.

Since the brain is incompressible, there is no appreciable relative movement between its parts as a result of linear acceleration; the notion that *coup* or *contrecoup* injuries are the result of alternate compression and rarefaction, due to free movement of the brain within the skull in the direction of the blow, must therefore be abandoned. A certain amount of shear may occur below the point of impact, particularly if the skull is broken, and this would account for *coup*. A much greater shear strain, however, develops as the result of rotation of the skull, and the fact that changes in rotational velocity are usually greater at the pole opposite to the point of impact would account for the more extensive injury of *contrecoup*. HOLBOURN'S observations do not abolish *contrecoup*, if the word is used to mean merely polar contusion; but they do refute the notion that polar contusion is caused by movement of the brain in a straight line till it bumps on the far side of the skull, since they show that *contrecoup* is really the result of shear due to rotational injury.

It should be recognised that almost all blows on the head rotate it, and the damage done to the brain depends on how firmly it is gripped by the meninges and internal conformation of the skull. An attractive feature of HOLBOURN'S presentation of the effects of shear is that it offers a clear mechanical explanation for the observations of DENNY BROWN and RITCHIE RUSSELL on cerebral concussion. Much remains to be discovered: what, for example, shear actually does to cerebral tissue; whether it affects cells or fibres or synapses; what it does to blood-vessels; and whether it can be a direct cause of contusion. Even as a simple extension of the experiments now described it would be important to know what happens when the forehead is struck, for we cannot accept the suggestion that, merely because rotation occurs in both cases, the effects are approximately the same as when the occiput is struck. Autopsies, of which there is unfortunately no lack, must not be neglected as a check upon laboratory experiments; for the damage done to the brain by a severe blow on the forehead is often most extensive at sites other than those affected by striking the back of the head.

WHAT KIND OF CORPORATION?

THE growth of public-utility corporations is one of the features of the twentieth-century British economic scene. In a timely review published in the last three issues of the *British Medical Journal* Mr. D. H. KITCHIN [1] points out that the public corporation or board embodies the principle that the best way to get a job done is to appoint capable and responsible people to do it and leave them as free as possible. The motive of successful and creative public service, he says, has proved quite as dynamic as the motive of private profit-making. This he considers not surprising, for much of the initiative and efficiency said to characterise private enterprise as opposed to official administration is provided by salaried workers who gain nothing material from their success.

An analysis of the constitutions of public corporations reveals two main types—those with boards built upon a representative basis, and those with appointed non-representative boards. Thus the Metropolitan Water Board is elected to represent the various local authorities concerned; the Port of London Authority is in part elected by ratepayers, wharfingers, and owners of river craft, and in part composed of appointed members representing the Admiralty, the Ministry of Transport, the London County Council, the City of London, and Trinity House; and the General Medical Council is partly elected by the profession and partly appointed to represent interested bodies. Two examples of non-representative boards are those of the British Broadcasting Corporation, appointed by the King in Council, and the London Passenger Transport Board, appointed by a group of trustees. Past experience has shown that where a board exists to perform functions that confer advantages on a number of bodies, there is much to be said for its being representative. If, however, its functions include the restriction of some bodies and the extension of others, for the common good, then a representative board is liable to find itself shot with dissension and reduced to impotence. In these circumstances, when a board is in effect a tribunal, its task is easier if it is non-representative.

Two types of corporate structure have been suggested for the national health service. Medical Planning Research [2] and now the British Medical Association [3] have proposed a national body, and the former specified that it should have a non-representative appointed board of governors, with representative advisory committees. In a special article a few months ago we put forward an alternative proposal for area corporate bodies, covering what we called health provinces.[4] These had governing councils representative of all hospital-owning authorities, health workers (including doctors) and local universities. If it wishes the medical services to be in the hands of corporate bodies, the profession will have to consider the relative merits of the different varieties—national and provincial, representative and appointed. Experience suggests that the structure should depend on the function they have to perform. We may suppose that a corporate health authority would have the following functions: first to employ doctors and their ancillaries (nurses, social workers, pharmacists, technicians, masseuses, dietitians, and hospital administrators), but not necessarily such personnel as clerks, porters, cooks, and cleaners; secondly to assess the health needs of the community and formulate plans to meet them; and thirdly to arrange that the plans are carried out. The chief means of securing execution of the plans would be to give or withhold financial grants for maintenance or extension: thus it would be necessary to reduce or even suppress the activities of some hospital-owning authorities, while increasing that of others. The first two functions—personnel and planning—could be performed equally well by elected representative bodies or by appointed non-

1. *Brit. med. J.* 1943, ii, 369, 399, 423.

2. *Lancet*, Nov. 21, 1942 (Suppl.). 3. *Ibid*, Oct. 2, 1943, p. 423. 4. *Ibid*, 1943, i, 813.

representative bodies. But the ultimate success of a national health service will depend on the vigour with which the plans are executed. Once the question of suppression of redundant inefficient institutions arises, there is a danger that representative bodies will split into groups according to the interests they represent. For a national health service to become maximally efficient in a minimum of time, its governors should probably be an appointed national non-representative board. This argument, however, will not convert those who believe that in the long run democratic control at all levels gives greater efficiency than a more authoritarian machine.

'FLU VACCINES UP THE NOSE

FOR some years F. M. BURNET has pointed out the theoretical advantages of immunising against influenza by spraying an attenuated but still living virus up the nose. In general, where live virus vaccines can be safely given they are more effective than killed ones; moreover, in an emergency it would not be difficult to produce in a hurry a lot of influenza vaccine of the necessary type. In Australia attempts have been made to test intranasal 'flu vaccines in the field.[1] Influenza viruses of three different strains were attenuated by amniotic passage in chick embryos and were administered by a de Vilbiss atomiser, each subject receiving 0·25 c.cm. Antibodies to the three virus strains were estimated, before and after the vaccination, by the Hirst test (inhibition of the agglutination of fowl red cells). About half those inoculated showed a rise in antibody titre against one or other virus—on the whole rather a poorer result than subcutaneous vaccination with inactivated influenza virus has produced here and in America. But it is urged that a virus given up the nose may produce antibody rise only in those in whom it can gain a foothold, in other words only in those susceptible persons whom we want to immunise; we do not care whether or not antibodies increase in the others, who are immune anyway. In support of this seductive argument it is recorded that when vaccinated people who had shown a good antibody rise to an influenza B vaccine were revaccinated 3 to 6 months later very few showed any further rise. No epidemic occurred among them to put their immunity to a real test.

One argument against the use of live attenuated influenza vaccines is based on a fear that they might increase in virulence by passage from man to man. There was no evidence that this happened in the Australian trials, either in those conducted during an influenza season or in those after it; the trials involved "tens of thousands" of soldiers. Reactions produced by the intranasal vaccines were frequent but almost all slight, mostly amounting to slight headache, coryza or stuffiness for a day or two, not going on to the mucopurulent stage which so often follows a real cold. Among the soldiers no reactions were bad enough to interfere with training. It is suggested that these reactions were allergic, as they were commoner in those with an initially high antibody level than in those with a lower titre. They were also more in evidence after a second than after a primary vaccination; the possibility of sensitisation to the chick-embryo fluids is not discussed.

There are virus-inactivating properties in human nasal secretions, and less certainly in tears, and these may have a great influence on liability to respiratory infection and response to intranasal vaccination. FRANCIS and others[2] have lately found that the neutralising activity of nasal secretions rises after subcutaneous injection of inactivated influenza vaccines, and suggest that on this, rather than on a rise in circulating antibodies as such, depends any value possessed by such vaccination. BURNET now reports the surprising discovery that freshly isolated human influenza strains differ from laboratory-adapted ones in not being neutralised by human tears; he does not say whether nasal secretions also show up this difference. Other sharp differences between fresh and laboratory-trained strains were observed; we must therefore be more cautious than ever in applying conclusions from the laboratory to the field.

The Australian work is likely to be applied to the control of a pandemic rather than to the prevention of minor outbreaks such as we have had in recent years.

1. Burnet, F. M. *Med. J. Aust.* 1943, 1, 385. Bull, D. R. and Burnet, F. M. *Ibid*, p. 389. Mawson, J. and Swan, C. *Ibid*, p. 394.

2. Francis, T. jun., Pearson, H. E., Sullivan, E. R. and Brown, P. M. *Amer. J. Hyg.* 1943, **37**, 294.

Annotations

TROPICS NOT SO UNHEALTHY IF—

A REPORT[3] from the medical department of a commercial airline operating a service from Bathurst, West Africa, down the Coast to Lagos, thence inland through the Sudan to Egypt (a distance of almost 5000 miles) and finally to India, shows how knowledge can be used to prevent disease. The first 2000 miles took in the semi-jungle country of the West Coast of Africa where although the temperature rarely exceeded 90° F. the humidity was always high, the rainfall reaching in some parts 200 in. a year and the humidity in others not falling below 90% for several months on end. Crossing the African continent the temperature increased but humidity fell, until in the Sudan and Egypt real desert conditions were encountered with average maximum temperatures of 110–115° F. and wide diurnal variations of 60–80° F., while in the Persian Gulf temperatures reached as much as 127° F.

Candidates for service with the airline were carefully selected and the age-limits were set at 18–45 years. A full clinical examination was supplemented by blood-counts, serological tests and X-ray examination of the lungs. Some 16% of applicants were rejected, the chief causes being cardiovascular diseases (20%), visual defects (12%), genito-urinary diseases (11%), and respiratory conditions (10%); those having a history of repeated attacks of venereal disease, chronic alcoholism or peptic ulcer were also regarded as unsuitable types. Accepted applicants were inoculated against smallpox, the enteric fevers, tetanus, yellow fever and cholera, and were provided with mosquito nets, anti-mosquito clothing, a sun helmet, and a supply of quinine and mosquito-repellant before sailing. Of the men sent to Africa less than 3% returned for medical reasons and none of these was seriously incapacitated. In Africa, hospital-bed accommodation was provided for 10% of the personnel, but in fact 1% sufficed. In large stations a medical and surgical officer was provided for each 600 men, but a doctor was posted to each station even when the numbers there were small. Well-trained laboratory staffs and adequately equipped hospitals with properly planned departments, including laundry services, played their part.

3. *War Medicine*, 1943, **3**, 484 and 619.

In West Africa, where malaria is rife, military statistics suggested that an attack-rate of 100% per annum, and in some parts even 200%, might be anticipated. However, apart from an outbreak in the first few weeks of hurried assembly—when 46 of 284 men were attacked, and almost 2000 days of work were lost by 300 men in 11 weeks—the malaria-rate proved extremely low. In September, 1942, there was only one case among 1400 employees and in October only 3 among 1800. This was attributed to the aggressive antimalarial measures applied at all the stations of the line. Besides the personal protective measures taken by the staff, all quarters and accommodation were screened and maintenance men were employed whose sole duties were to keep the screening in order. Antimosquito locks of adequate proportions were provided for all entrances, which were kept to the minimum, and all doors were fitted with automatic spring-closing devices. Quarters were sprayed daily and the adjacent native quarters were similarly treated. Oiling, dusting and drainage of potential breeding areas were also carried out and continuous maintenance gangs looked after these works; some 45 miles of ditches were dug in one station alone. Flying personnel had blood-examinations before every flight and the value of this was proven by the fact that in nearly every instance where positive smears were obtained the subject developed a clinical attack within 24 to 48 hours. In the treatment of the acute attacks various combinations of drugs were tried without any striking differences in the therapeutic results, and finally a routine course of quinine, gr. 30 daily for 2 days, followed by mepacrine hydrochloride, 0·3 g. daily for 5 days, was adopted. Almost all the infections were malignant tertian and it was not considered that anything was lost by the omission of pamaquin from the treatment. Quinine and mepacrine were used in suppressive treatment and no evidence was forthcoming that mepacrine diminished tolerance to altitude.

Gastro-intestinal diseases were next in frequency to malaria, and were well controlled by the screening of messes, kitchens and latrines against flies. Before this was done some 20% of the personnel at one station contracted diarrhœa once or twice a month; and in another station the rate fell from 30% to 0 on the installation of flush toilets and the screening of quarters and kitchens. The importance of periodic examinations of all native food handlers was shown by the fact that 28% of the natives were found to be carriers of *E. histolytica*.

Psychiatric problems, often stressed as a cause of trouble in the tropics, were found to be relatively unimportant; but all the personnel were volunteers and their living conditions and food were unusually good. Surgery presented no special difficulties and sepsis was not more common than in temperate regions. The medical staff was convinced that the climate as such had no deleterious effect on health and it was the unanimous opinion that good health can be maintained in the tropics provided preventive measures against disease are aggressively applied.

SENSITIVITY TO PAIN

PAIN is difficult to assess, and the word "sensitivity" is itself ambiguous, for both the man who feels little pain and the one who feels the pain but bears it stoically may be called insensitive. Sherman[1] refrains from a definition, and waits for his patient to "wince, change expression, or cry out," in response to a gradually increasing painful stimulus. His instrument of torture (Hollander's method) is a metal grater, with the business surface in contact with the subject's arm, on which it is pressed by an inflated sphygmomanometer cuff. The pressure at which the victim reacts spontaneously is taken as a measure of his threshold to pain, and he is accordingly classed as hypersensitive, hyposensitive or normal. In spite of the errors likely to be involved in both the stimulus and the reading of the response, any well-marked difference between large groups of patients examined by the same investigator is probably significant. In two series, each of 130 patients, one group with organic and one with functional disease, Sherman finds practically the same proportion of hyposensitive persons (16–17%), while only 6% of patients with organic disease, as against 30% with functional, are hypersensitive. The results are confused by a sex difference, 75% of all the hypersensitive cases being women and 90% of the hyposensitive men, a finding possibly indicating only that women are more thin-skinned than men. The fact that 34% of the hypersensitive cases are under 20 years of age may be open to a similar interpretation. Corroboration by Libman's test of pressure on the styloid process can scarcely be accepted, since there is no way of measuring the intensity of the stimulus. The difference between patients with functional and organic disease seems the most reliable finding, and is rounded off by the study of a group of 150 exceptionally hardy men (coal-miners) who treated even organic disease with contempt. None of them was hypersensitive, and 75% were hyposensitive. A similar distribution of sensitivity in a group of Indians suggests that indifference to pain may be inherited. An investigation of this kind is worth repeating with more precise methods. Routine clinical testing is one thing, but research to establish a principle is another. These results merely extend those of Wilder,[2] who used the same method. An electrical stimulator described by Knowlton and Gross[3] for studying analgesics in dogs would be little more troublesome to apply, but is quantitative, avoids the mixture of sensations which must accompany the gradually increasing pressure of the grater in the sphygmomanometer cuff, and allows of a rest between the increasing stimuli, thus eliminating the adaptation of the pain endings which must occur with a continuous stimulus. Repeated testing of the same individual on different days should also be done, because Knowlton and Gross found a certain variation of threshold in their dogs. They used a slight widening of the eyelids as indicative of the first response to pain, and it is possible that in man some such consistent index could be found. From the clinical standpoint, Sherman's findings are useful confirmation of a general impression, but if they were further substantiated they might lead to a reliable test for helping to distinguish between functional and organic disorder.

1. Sherman, E. D. *Canad. med. Ass. J.* 1943, **48**, 437.

TREATMENT OF METHÆMOGLOBINÆMIA

METHÆMOGLOBIN in the blood has been classically associated with hæmolytic diseases, certain poisons, and enterogenous cyanosis. We now know that in hæmolytic diseases the pigment is methæmalbumin, but the other two are definitely methæmoglobinæmias, and the distinction is easily made if one remembers that in hæmolytic diseases the pigment is in the blood plasma whereas in the others it is confined to the red blood-cell. There is one other very rare form of true methæmoglobinæmia; this is one of the "inborn errors of metabolism" and the victims have a varying proportion of their blood hæmoglobin in that form. They suffer no disability, since the total blood-pigment is usually increased so that the normal amount of oxyhæmoglobin is available, but the presence of the methæmoglobin gives them a slaty-blue colour that is ugly, often exposes them to unnecessary investigation, and causes alarm. This disease is so unusual that it might well remain buried in the literature, but it now appears that it can be treated. At a meeting of the Royal Academy of Medicine in Ireland on May 7, J. Deeny, H. Barcroft and D. C. Harrison described two brothers with this condition;

2. Wilder, R. M., jun. *Proc. Mayo Clin.* 1940, **15**, 551.
3. Knowlton, G. C. and Gross, E. G. *J. Pharmacol.* 1943, **78**, 93.

both had slate-coloured faces and hands, but, like other cases, their general health was good, although both had about half of their total blood-pigments in the form of methæmoglobin. In 1939 French workers showed that ascorbic acid has a favourable effect on this disease; Deeny and his colleagues confirmed this—in one case a daily intravenous dose of 100 mg. of ascorbic acid reduced the methæmoglobin from 43% to 6% of the total blood-pigments in a month; there was a simultaneous reduction in the total blood-pigment and in the red-cell count. The ascorbic acid appears to act by converting the methæmoglobin to ordinary hæmoglobin. It will be interesting to see if the same treatment can be applied successfully to other forms of methæmoglobinæmia, especially that due to drugs.

CORNEAL GRAFTING

IF an eye is to see, the central three millimetres of cornea must remain transparent; a dense scar in this area will blind an otherwise normal eye. Opacities from corneal ulcers, interstitial keratitis, ophthalmia neonatorum, and wounds or burns of all kinds have condemned many patients to permament blindness, so it is not surprising that surgeons have tried to graft clear cornea on scarred eyes for over 100 years. Even before that, the problem of the leucomatous eye was stirring the mind of Robert Mead,[1] who in 1775 suggested putting equal parts of powdered glass and sugar, "levigated into an impalpable powder," into the eye every day; this, he wrote, "gradually absterges and wears off the spot by its inciting quality." Reisinger[2] was the first to attempt corneal transplantation, for in 1818 he replaced the cornea of one animal with that of another, and at the end of twenty days half of it remained transparent. In 1838 Kissam transplanted the cornea of a six-months old pig to a human eye, but though vision improved immediately after the operation the graft later became opaque. Similar operations were tried by other surgeons but the graft never remained transparent for long, and it is now established that all grafts of animal cornea to man are doomed to failure.

The possibilities of the operation were revived in the '70s by A. von Hippel,[3] who invented a trephine which simplified the procedure and was the first surgeon to transplant from one human being to another a portion of cornea which remained permanently transparent. Using von Hippel's trephine, Zirm[4] reported an exceptionally successful case in 1906, the donor being a boy of 11 whose eye had been lost by injury. From perception of hand movement only, his patient's vision improved to 6/36 more than a year after operation, proving that under certain conditions the operation could be a sight-saving one. Isolated reports continued to appear, but no series from which the success of the operation could be judged was published until K.W Ascher (1919–22) from Elschnig's clinic, and later A. Elschnig[5] himself (1930), published the results of all grafting operations performed in the clinic up to date. The grafts used were whole thickness of cornea, circular and 4–5 mm. in diameter. They were taken from an eye which had had to be removed from another patient, or from an eye enucleated shortly after death. Elschnig found that the graft will be successful in 22% of patients who give no evidence of increase of ocular tension, but that if only the patients suffering from interstitial keratitis are considered the results will be much better than this. W. P. Filatov[6] in Odessa has performed more of these operations than any other surgeon. Up to the end of 1938 he and his school had done 537 transplants. He made several modifications in the operation, but more important than these was his discovery that for transplantation the cornea from a cadaver is at least as good as, if not better than, that removed from a live eye. The eye from which the graft was to be taken was removed up to 24 hours after death and kept at 2–4° C. for from one to eight days. In his series, using cadaveric material, 146 transparent grafts were obtained in 366 cases—40%. The donor's blood was always tested for syphilis, but the blood-group of the donor has no bearing on the chance of a successful operation. Von Hippel noticed that in a successful case the recipient's cornea immediately adjacent to the graft increases in transparency, perhaps because of the increased blood-supply to the cornea necessary to keep the new graft alive, so Filatov has tried grafting the peripheral part of a leucomatous cornea and the centre of the cornea has tended to clear; no precise records of these cases are available yet. In America Castroviejo[7] and his associates at the Columbia Presbyterian medical centre have performed more than 100 corneal grafts. In favourable eyes he says that 85% success may be expected and in 2 cases vision improved from hand movements at one foot to 6/6. In this country Tudor Thomas[8] has done the pioneer work and reported 36 operations by 1937; he says that the graft remains transparent in 86% of favourable cases. Now Leahey[9] who used Castroviejo's twin knives, has published his results in 10 patients. All were improved and several could read book print, the best distant vision being 6/24.

Corneal transplantation, then, has established itself as a practical proposition, and under certain circumstances a high percentage of success can be expected. For good results the ocular tension should be normal and the graft should have areas of semitransparent cornea adjacent to it; because of this and of the ghost vessels already present in the cornea the best results are achieved in interstitial keratitis. There is no doubt that grafting will rescue some of the many eyes blinded in this war by burns and scars of the cornea.

PHENOTHIAZINE UNSUITABLE FOR TREATING THREADWORMS

PHENOTHIAZINE was first tried in the treatment of threadworms by Manson-Bahr.[10] In an investigation of its pharmacology de Eds, Stockton and Thomas[11] had previously recorded an anæmia in 3 patients out of 19 who were being given the drug as a urinary antiseptic, and a similar report came from Hubble,[12] who saw 3 cases of anæmia among 30 children treated. Doubts about the employment of phenothiazine were justified by the death from acute hæmolytic anæmia of a child aged 6 who had been given 8·5 grammes,[13] and two further instances of severe hæmolytic anæmia following its use have been reported by Johnstone[14] in this country and by Grant[15] in Australia. The opinion that it is valuable against threadworms has been qualified by this evidence into a general distrust of its toxicity in children. Veterinary experience has also been that, while it is a reasonably safe anthelmintic for adult animals, it is dangerous to young ones, especially pigs.[16] If any therapist needs further dissuasion from its use, this is provided in a report by Bercovitz, Page and de Beer,[17] who not only confirm the accounts of its toxicity published in this

1. Medical Works of Robert Mead, Edinburgh, 1775, p. 410.
2. Die Keratoplastic, Sulzbach, 1824, vol. I, part 1, p. 207.
3. *V. Graefes Arch. Ophthal.* 1878, **24**, 235.
4. *Ibid*, 1906, **64**, 580.
5. *Arch. Ophthal. N.Y.* 1930, 4, 165.
6. *Lancet*, 1937, i, 1395. Modern Trends in Ophthalmology, Ridley and Sorsby, London, 1940, p. 582.
7. Spaeth's Principles and Practice of Ophthalmic Surgery, Philadelphia, 1939.
8. Thomas, J. W. T. *Brit. med. J.* 1937, i, 114.
9. Leahey, B. D. *New Engl. J. Med.* 1943, **228**, 387.
10. Manson-Bahr, P. *Lancet*, 1940, ii, 808.
11. de Eds, F., Stockton, A. B. and Thomas, J. O. *J. Pharmacol* 1939, **65**, 353.
12. Hubble, D. *Lancet*, 1941, ii, 600.
13. Humphreys, D. R. *Ibid*, 1942, ii, 39.
14. Johnstone, R. D. C. *Brit. med. J.* 1942, i, 259.
15. Grant, L. I. H. *Med. J. Austr.* 1943, ii, 27.
16. Davey, D. G. and Innes, J. R. M. *Vet. Bulletin*, 1942, **12**, 8.
17. Bercovitz, Z., Page, R. C. and de Beer, E. J. *J. Amer. med. Ass.* 1943, **122**, 1006.

country but also show that, in doses well above the danger level for children, it is not effective against the threadworm (*Oxyuris vermicularis*). Of 10 patients they treated 8 failed to give the three negative swabs regarded as necessary to establish a cure.

Fortunately there is no need to lament the departure of phenothiazine, for its place in the treatment of threadworms has been taken by gentian-violet which is given in coated capsules of grain ½. The dose is one capsule a day for each year of age up to six years, and this dose is continued for a week. A second course may be given after an interval if worms are seen in the fæces or ova are still discovered on the swabs. With these doses no toxic effects have been recorded. Wright and Brady[18] obtained 60–90% cures by its use in adults and children, and subsequent clinical experience rates its efficiency more highly still.

FERTILITY AS A CONTROLLABLE FACTOR

JUST now population trends are exciting the opposite-minded to argument—some saying let us have more of one kind of men and others saying let us have less of every kind. Across the controversy the statement of experts convened by the British Social Hygiene Council breathes like a voice from the laboratory. Whatever we think about man, few of us want to picture him as a dying race; and whether we want to extend fertility or reduce it we should prefer not to have the issue taken out of our hands by biological failure. The experts produce evidence (see p. 457) of involuntary impaired fertility in the population which is striking. Experience has shown that in many cases the reproductive function can be restored or improved. Since devices for reducing fertility have stimulated investigators, and are now becoming reliable, treatment for improving it should excite at least equal interest. The plea for better facilities for skilled diagnosis and treatment of all grades of infecundity is sensible and timely.

SERUM REPLACEMENT IN BURNS

THE most profound change that can be demonstrated in the blood of a burnt patient is loss of protein and water. When serum and plasma transfusion was made available some years ago there seemed to be a good chance of saving the lives of those whose burns extended beyond the critical one-third of the total body surface. Unfortunately these hopes were not always realised and it seemed possible that other factors were of greater importance than simple plasma loss. Presman and his associates[19] however believe that the failure of intravenous serum therapy has been due to the use of insufficient quantities. They refer to the work of Elkinton, Wolff and Lee,[20] who maintain that damaged capillaries do not regain their normal permeability (and will therefore go on leaking plasma) for up to 40 hours after a burn. During this time not only must the normal bodily requirements be met, but any loss must be continually made good if a fatal reduction of blood-volume is to be avoided. They cite two cases in which 45% and 50% of the body surface had been burnt and whose hæmoglobin, protein, non-protein nitrogen and hæmatocrit values were recorded during treatment. An estimation of the blood and plasma volume was made from the body weight. Each patient received 4250 c.cm. of serum during the 68 hours following the burn, 1750 c.cm. being given during the first four hours. In addition other fluids were given by mouth and vein, so that one patient took no less than 19,970 c.cm. of fluid during the 68 hours after the burn—that is, 7000 c.cm. in excess of normal requirement in 24 hours. As a result, it is said, of these heroic measures, both patients made uninterrupted recoveries. Unfortunately the parsimonious equipment of many hospitals precludes any attempt at accurately controlled treatment on these lines; and indeed where the patient may have been anæmic before sustaining the burn any attempt to maintain a *normal* hæmatocrit value might meet with disaster. Presman and his colleagues therefore conclude with a simple rule to follow in the treatment of severe burns. They recommend that 50 c.cm. of serum should be given into a vein immediately for every 1% of body surface which has been burned, with an additional 20–30 c.cm. for every 1% during the first 24 hours and another 20–30 c.cm. in the first 72 hours following the burn, thus totalling 100–110 c.cm. for each 1% of body surface burnt. These recommendations may be summarised as follows:—

	Volume of serum to be given for each 1% of burnt surface.
Immediately	50 c.cm.
During first 24 hours ..	20–30 c.cm. } in addition.
During first 72 hours ..	20–30 c.cm. }

They state further that no crystalloid fluid should be given during the first 24 hours, but that fluids and a high-protein diet by mouth should begin as soon as possible. It is to be hoped that others will have the same measure of success with their method.

18. Wright, W. H. and Brady, F. J. *Ibid*, 1940. **114**, 861.
19. Presman, D. L., Janota, M., Weston, R. E., Levinson, S. O. and Necheles, H. *J. Amer. med. Ass.* 1943, **122**, 924.
20. Elkinton, J. R., Wolff, W. A., and Lee, W. E. *Ann. Surg.* 1940, **112**, 150.

THE LAST OF DR. THORNDYKE

Dr. Austin Freeman, whose death is announced on another page, gave more pleasure to his colleagues, in his time, than perhaps is usual in our profession. If Conan Doyle set the standard for scientific crime investigators, Austin Freeman, in his stories of Dr. John Thorndyke, has carried on the Holmes tradition scrupulously. Like Holmes, Thorndyke is credibly—but only just credibly—well informed; he has the same passion for accuracy, the same meticulous attention to detail coupled with a considerably greater knowledge of laboratory technique, and an equal disregard for the lure of matrimony. He lacks Holmes's more spectacular and endearing side, perhaps: no opium, no violin and no situations contrived for theatrical effect find their way into Thorndyke's well-regulated life. Here is a serious-minded scientist, and the reader is expected to get his fun out of the hard labour of detecting, not out of the foibles of the detective. He does, too. Whether helping Dr. Thorndyke to look into the manners and customs of marine worms, or breathing down his neck while he examines (for arsenic) a lock of hair from a long-dead girl, the reader gets his ration of interest and excitement; and he is blessed with an encyclopædic mind who puts down an Austin Freeman without having learned some odd new fact or other. Doctors, many of whom are martyrs to detective literature, nearly always enjoy the details of medical jurisprudence which Thorndyke had at his finger tips. It is perhaps a measure of Freeman's skill that he often dispensed with surprise in his puzzles; he could tell his story backwards—beginning with the culprit and working through the steps by which he was undone—without losing his reader's attention.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.—On Monday, Oct. 18, at 2.30 PM, Dr. W. E. Hume will deliver the Harveian oration.

ROYAL SOCIETY OF MEDICINE.—On Tuesday, Oct. 12, at 5 PM, Dr. W. Norwood East will deliver his presidential address to the section of psychiatry on the state, the criminal and the psychiatrist. Mr. Malcolm Donaldson will give his presidential address to the section of obstetrics and gynæcology on Oct. 15, at 3.30 PM. He will speak on the cancer problem from the point of view of the young gynæcologist and a discussion will follow. There will also be a discussion after Dr. N. S. Finzi's presidential address to the section of radiology at 4.45 PM on the same day. The subject is to be impending new developments in radiotherapy.

Special Articles

CARE OF THE CHRONIC SICK

LETITIA FAIRFIELD, CBE, MD, DPH

PROBLEMS raised by chronic sickness are important but have been neglected in most schemes for medical reorganisation. Chronic sick patients are numerous, especially in the higher age-groups, and their long occupancy of beds holds up a high percentage of the total accommodation. From the administrative point of view they overlap with the crippled or "physically handicapped" and in the upper ages with the "aged and infirm." Hence the total numbers cannot be exactly estimated, but the extent of the problem may be partly gauged by the London figures.

Chronic sick in London	*August 1939*	*March 1943*
(*a*) In public health chronic sick establishments	3818	2314
(*b*) In acute general LCC hospitals	1400	1600
(*c*) In social welfare institutions	416	35
Total	5634	3949

(The numbers in March, 1943, were reduced by evacuation)

In addition about 35 chronic sick are maintained in voluntary institutions by the London County Council and a considerable number (who cannot, however, be separated statistically from the aged and infirm), are living at home on out-relief. The number of chronic sick not maintained or assisted out of public funds is even more difficult to ascertain but must be considerable. For every category there is a serious need for paying accommodation to meet different grades of income.

(A) PREVENTION

Every advance in medicine and surgery brings some reduction in the number of permanent invalids, and good national planning bringing the best medical skill within the reach of all, will presumably also reduce the numbers of chronic sick; the impending increase in the average age of the population, however, will keep up the *relative* proportion of chronic invalids. Of recent years, the improved care of surgical tuberculosis, of anterior poliomyelitis, and rheumatic heart disease has enormously reduced the number of the permanently disabled among the young. A fortunate flash of inspiration on the treatment of arthritis, or of chronic lung disease would have a similar effect in clearing the adult wards. Schemes now afoot for rehabilitation after illness and accident should also have a slow but steady effect in reducing the numbers to be provided for. It will be assumed therefore that the chronic sick whose care we are considering are the irreducible minimum of permanently disabled persons incapable of self-maintenance and requiring permanent medical supervision and usually some degree of nursing care.

(B) CLASSIFICATION

Classification is not easy because the patients cover all ages, an immense range of diseases and wide differences of mental capacity. Their needs, whether physical or mental, are not all the same. Any system of grouping should therefore take into account: (1) age; (2) degree and nature of disability (e.g., bedridden or ambulant); and (3) mental capacity and temperament.

(1) *Age.*—Experience has shown that the chronic sick may conveniently be divided into four age periods:

(*a*) Children under 16. Most children who require long hospital care may now be considered as long-term treatment cases rather than chronic sick, but a few unimprovable or deteriorating cases remain. They include disabling congenital deformities such as spina bifida with incontinence, progressive paralyses, advanced cardiac disease and other rarer conditions.

When the LCC took over the guardians' responsibilities in 1930 some of these children were found lying in great unhappiness among senile cases in the wards of municipal hospitals and institutions. A separate unit was formed for them in a small LCC children's hospital in 1933. It never contained more than 25 children, though cases were received from outside London in addition. A teacher was provided by the education officer and the children had access to a garden. The unit though an improvement on their previous surroundings was never a complete success. The children's diverse ages and intelligence levels made the task of teaching and amusing them almost impossible, while the staff found their duties exacting and unproductive of results. At the outbreak of war this unit had to be broken up and the children were distributed among the long-term orthopædic and rheumatic cases at Queen Mary's Hospital, Carshalton, according to their age and disability. Here they are far happier and better placed. No staff has to be specially allocated to them and they enjoy contacts with more normal children and the wider range of interests found at Carshalton. Probably the cost per head is no greater than when they were segregated in a special unit.

(*b*) Adolescents and young adults. These patients resemble the group under 16 from the medical point of view, and many of them have in fact spent many years under treatment in children's hospitals. Some are in the terminal phases of fatal disease, others have years of life ahead. In some ways they are more difficult to provide for than the children as they have more insight into their fate. They must be as fully occupied, body and mind, as their condition allows, and they need whatever medical and nursing care can mitigate their disease. Handicraft instruction, books and discussions on current affairs, and the teaching of simple occupations such as flower-making or toy-making or embroidery should all be included in the schemes for their care. Even the bedridden can often earn a few shillings a week with some benefit to their pockets and immense benefit to their self-respect. They feel they can do something for somebody, which is almost a definition of life as opposed to stagnation. The upper limit of this young adult group need not be too strictly drawn but it has been found from experience that the young incurables do greatly enjoy each other's company and separation from the more depressing older invalids.

(*c*) Older but mentally alert adults. These are mostly the victims of arthritis or disseminated sclerosis or chronic heart or lung disease. They are usually past the training stage but are capable of carrying out simple needlework or handicrafts, and they enjoy wireless, visiting and books, and the amenities of life they have been accustomed to. It is important to keep them apart from the senile group and from constant association with the dying.

(*d*) The mentally deteriorated and senile. A large proportion of the chronic sick are of advanced age and others are suffering from some disease such as cerebral thrombosis which has impaired their mental faculties. These old people's requirements naturally vary with their physical condition and social background, but a great number seem well satisfied with a little knitting, some wireless, sufficient food and warmth. They greatly value visits from relatives or old friends, but the advances of strangers, however well-meaning, are apt to meet with a poor response. As a ward-sister recently remarked to me, "They live in the past and take less interest in present contacts than one would think."

2. *Degree and nature of disability.*—The diagnosis of "chronic sick" is a serious one for the patient and should only be made with a full sense of responsibility and after careful examination. If the case has not been fully explored already, it is advisable to arrange for complete overhaul in a fully equipped acute hospital. An estimate can then be made of the amount of incapacity, the probable expectation of life, and the need for palliative treatment such as massage. If the question of training for a trade or admission to a sheltered workshop arises, the doctor consulted should have some knowledge of the problems involved in the training of the handicapped. Lack of these obvious precautions has led to deplorable errors in disposal, as for example, patients with minor or improvable defects being cast unnecessarily into the stagnant pool of a workhouse ward, while others with progressive paralysis or advanced heart-disease may be sent for expensive trade training.

Medical supervision of all chronic sick though not necessarily continuous should be careful and efficient, the patient being kept at his maximum of physical efficiency and comfort. At the same time wasteful procedures such as long-continued massage or hydrotherapy, producing no real benefit, should be avoided. Periodic overhauls will ensure that no unexpected improvement has taken place or no intercurrent disease has developed.

For the bedridden good nursing is essential, and these patients afford excellent nursing training. The question of nursing the chronic sick remains the subject of controversy. It is becoming generally recognised now that the ordinary

nurse in her training should learn something of their care, but it does not follow that the highly qualified "trained nurse" is the best person to staff chronic sick wards. In the opinion of many superintendents, the assistant nurse comes much nearer the ideal for this purpose. Some women (not always the best examinees) have a special vocation for chronics and the aged, as others have for children, and well-organised schemes will endeavour to make full use of this fact and to give these nurses an honourable place in the profession.

3. *Mental capacity and temperament.*—Wise planning for the chronic sick entails the estimation of their mental condition and temperament. The psychotic and the mentally defective should be dealt with as such, under the ample legal provision made for them, and should on no account be mixed with chronic sick patients of normal mentality. This is a matter of much greater importance to the patients, who have to live at close quarters with each other, than to the staff. Any scheme should also include some machinery for classifying and segregating senile dements, who are apt to be intolerably noisy and offensive neighbours. In London it has been customary for many years to transfer such senile patients without certification to a separate institution.

Where training schemes are contemplated, an exact estimate of the patient's intelligence becomes important and an intelligence test should be applied by an expert. The casual observer is most likely to go wrong in dealing with spastic, athetotic or hydrocephalic cases. The common tendency is to *under*estimate the mentality at first sight, then to *over*estimate it and to form much too hopeful a view of trainability, with inevitable disappointment.

(C) DISPOSAL

The alternatives before those who have to provide for the chronic sick are :—

(*a*) Home care by relatives or guardians.
(*b*) Voluntary homes.
(*c*) Special wards or departments in acute general hospitals, voluntary or municipal.
(*d*) Special municipal hospitals.

(*a*) *Home care* is, in the opinion of many experienced doctors, nurses and social workers, the method of choice.

That this feeling still prevails among the public was shown by the fact that on the morning after air-raids began again in the spring of 1943, 68 chronic sick persons were sent in to one LCC hospital in South London. The relatives were willing and anxious to look after them under normal conditions but could not get them into air-raid shelters. It is an indication of decent feeling in a community that people should want to look after their helpless relatives and chronic invalids, who on their part are usually happiest at home. There they can obtain emotional satisfactions which few institutions can give and they can find useful natural outlets for their energies in place of work expensively devised for them. Friendly visiting by philanthropic organisations can often be arranged, and the Boy Scouts and Girl Guides have excellent schemes for keeping in touch with bedridden young people. The chief obstacles in the way of family care for chronic invalids are : (1) inability to undertake the nursing (here good district nursing associations can help, and should always be in the forefront in the care for the chronic sick); (2) inability to maintain a "bouche inutile." Here a sympathetic and constructive attitude on the part of the public assistance authorities is all important. The Poor Law Act, section 14, is almost the only statutory expression of family responsibility now remaining. Outdoor relief is a real economy if it prevents unnecessary institution or hospital admissions. It should recognise generously the invalid's special needs—for example, extra nourishment and surgical appliances. The new Act of 1943 enables larger money allowances to be given and if the Beveridge report materialises, these benefits will all come under the heading of security assistance and not of public assistance.

In many cases even if nursing and financial help are available the invalid puts an excessive strain on family resources—or there may be no relatives. The alternative of boarding-out with strangers is theoretically possible but in practice it rarely works well with the chronic sick. Few conscientious people are willing to undertake the responsibility of invalids not related by blood, and the authorities naturally have to guard against the unscrupulous who would only too willingly exploit the helpless for gain. In a large number of cases, therefore, institutional care of some kind is inevitable.

(*b*) *Voluntary homes.*—In making the voluntary home the second method of choice, I am using the accumulated experience of officers in the Public Health and Social Welfare Departments over 13 years. These homes are preferred by most of the younger patients. They offer a freedom from restrictions, a sense of independence and homeliness, which the larger institution cannot reproduce. Often, too, the staff have a special sense of vocation and the atmosphere is coloured by their religious beliefs in a way helpful to patients. Voluntary homes now available vary from small and shabby establishments with a dozen beds, run by a pious old nurse, to large specially built hospitals such as the Anglican homes at Woking and St. Peter's, Kilburn, and the Catholic home at St. Joseph's, Edmonton. Most of these homes provide handicraft instruction; they give the women and men opportunities for shopping and visiting neighbouring places of entertainment, and some have facilities for massage and light therapy. The most valued feature of the voluntary home is the freedom with outside contacts it allows and the liberty given to the patients to keep their own small possessions round them and to wear their own clothes.

Voluntary homes for chronic sick are usually—but not always—registered as nursing-homes and should be carefully and strictly inspected. Not only the small ones run for profit but the large establishments of famous religious orders have dangerous potentialities. Their cardinal faults are overcrowding, understaffing, and the admission of mental and senile patients who annoy others.

I have known a paralysed man not washed all over for three months, a paralysed woman left to starve on a few sips of milk a day because no food chart was kept, an advanced cardiac case terrified by a senile dément who was allowed to wander into her room with a knife. All these incidents took place in well-known institutions, but they all should have been prevented by adequate inspection and strict insistence on rules. An important point is that patients should not be sent beyond reasonable distance from the area of the local authority maintaining them (about 50 miles is roughly our limit in London). They can be visited and inspected from time to time and recalled to hospitals of the responsible authority for overhaul and treatment if necessary. Town planning schemes should take into account the need for these small homes and hostels when framing regulations for zoning.

Chronic sick patients maintained in voluntary homes should be carefully selected and some trouble taken to allocate them to the right type of home. The following classes of patients will be found unsuitable and should be otherwise accommodated :—

1. Those requiring heavy nursing—unless the responsible authority is convinced that an adequate supply of skilled nurses is *continuously* available in the voluntary home.

2. Those with disabilities offensive to other patients at close quarters (incontinence, unsightly skin diseases, persistent sinuses).

3. Patients of quarrelsome or neurotic temperaments. If efforts to adjust these patients to their surroundings fail and they persist in creating an atmosphere of misery around them, they should be brought into a large institution where they can do less harm. Repeated attempts at placement mean mistaken philanthropy.

4. Mentally deteriorated patients.

Even before the war there were far too few voluntary homes for women and hardly any for men. The practical difficulty confronting these voluntary homes is that the turnover is so slow that subscribers lose interest, and they are hard to maintain. The few large well-endowed chronic hospitals are difficult of access and rarely have vacancies. A few "homes for the dying" exist, which perform a most valuable function in the last phases of disease. Their number could probably be greatly extended if an appeal was made to religious bodies for this kind of service. The present cost of these homes is up to £2 5*s.* per bed per week. The maintenance is much cheaper than in public institutions, and gives happier results.

(*c*) *Special wards in acute general hospitals.*—The treatment of the chronic sick has been consistently unpopular with both the medical and nursing professions. The voluntary hospitals, great and small, would have little to do with them and the honour of making the

necessary and humane provision has therefore been almost exclusively that of the municipal hospital.

The teaching hospitals have suffered from this attitude, for both the budding doctor and the nurse have much to learn about the treatment of the bedridden and of the mitigation of advanced stages of disease. It is this kind of case which they very commonly meet in general practice. The chronic sick have suffered from this ostracism too, for a tradition of hopelessness and inertia has grown up around their problems, and undoubtedly much that could make their lives brighter and reduce their numbers has been omitted.

For the future it has been suggested that all general hospitals, including the great teaching hospitals, should be compelled to reserve at least 10% of their accommodation for chronic sick.

As the turnover would be slow, it might be advisable to reserve these wards for specially selected types of chronic sick —for instance, terminal phases of fatal disease, patients with chronic conditions requiring treatment or on whom new methods of treatment could be tried, patients needing an overhaul or full examination before transfer to another institution. It might be thought advisable to limit the stay in these chronic wards to 6 months as a general rule. It should be clear that these wards, to be any use, must be in the main hospital; dumping the patients in a country branch miles from their friends would be no solution.

DISCUSSION

Even after all suitable cases had been placed in voluntary homes and the voluntary hospitals have taken a 10% quota the bulk of the chronic sick will remain for the municipal hospitals to dispose of. The first important change required is improved classification. In this, many hospitals have admittedly failed largely owing to the fact that the accommodation has never kept up with the demand.

A beginning has however been made. We have had 10 years' experience of an adolescent chronic sick male unit for 25 lads and men at Queen Mary's Hospital at Sidcup, which is an outstanding success. A handicraft instructor was secured who created interest and enthusiasm in his workers. Being situated in a convalescent home with plenty of entertainments to which the young men had access, and plenty of contacts with the normal world, the atmosphere is cheerful and stimulating. To put a unit for severely handicaped chronic sick in the middle of a convalescent hospital was a daring experiment, but has proved a success largely owing to the personal enthusiasm of the staff and the fact that the proportion of chronic sick has been kept small. A similar unit for young women is being developed at another LCC hospital.

Of the remaining chronic sick, the younger and more mentally alert should be gathered in the better type of ward at the disposal of local authorities. Sun balconies should be provided where there is no access to gardens. Some of the wards should be divided into bays or cubicles by partitions to give more privacy. The patient's previous social background largely determines whether he prefers privacy or sociability. Many Londoners are wretched in small rooms.

The most desirable move, however, would be to allow the patients to have a small space around them for their family portraits, pictures and a few small possessions. Even a locker-top is better than nothing. "You would make the place look like a home and not a hospital" said an indignant matron when I suggested this. That was in fact the idea. It is the only home these poor creatures will ever know. The possibility of combining such accommodation with a sheltered workshop where a simple trade could be carried on is being explored.

The senile and mentally deteriorated are probably quite as happily placed in their long open wards, with a day-room annexe, as they could be anywhere. For them the most important factor is to be near relatives whom they remember, for contact with strangers is no particular pleasure to them. Small dietary changes and treats, such as cakes and sweets, are almost their only other pleasures.

How far the chronic sick in municipal hospitals should be gathered into separate institutions, or how far accommodated in special blocks or wards in general hospitals, is a difficult question. It will depend largely on the accommodation at the disposal of the authorities. If the classification outlined above is carried out, it should not greatly matter to the patients themselves but it does matter a good deal to the staff. Few nurses and doctors like to work in a big hospital devoted solely to the senile and incurable and the number of such establishments should be reduced to a minimum. Wards or departments for some acute specialty, or research units, say dealing with arthritis or diabetes, might well be combined with chronic sick accommodation.

Whatever method of disposal is adopted, all grades of chronic sick should have ample and varied food, warmth, cleanliness, and devoted and skilled nursing according to their needs. Equally important is full occupation for body and mind up to the limit of their capacity.

STERILITY AND IMPAIRED FERTILITY

CONCLUSIONS' AT A CONFERENCE CONVENED BY THE BRITISH SOCIAL HYGIENE COUNCIL *

THE official census data do not yield any direct information concerning the frequency of sterility (childlessness) or impaired fertility (small number of children). Nearly all information in this field springs from the general experience and the specific efforts of individual workers—mostly clinicians interested in the treatment of involuntary sterility. The following summary reflects the views formed by British and American investigators.

About a tenth of all marriages remain childless. It has not been suggested that there are class differences which would reveal themselves without specific statistical investigations. Childless marriages among working-class patients are common.

Permanent childlessness is rarely deliberate. This conclusion is based on the experience of medical practitioners and on specific investigations. Thus inquiries were made among industrial workers in order to ascertain how many of the married but barren women were deliberately childless. This inquiry was conducted by a doctor who interviewed personally every woman; and the inquiry was appropriate since the childless women numbered up to 18% of groups (consisting of about 50 women each) questioned. Similarly another investigator inquired into the history of about 70 childless middle-class families who had not applied for advice. It appears that in about 90% of childless couples who have been married for at least 5 years the absence of children was caused by impaired reproductive power (low fecundity).

Furthermore, such inquiries among patients who did not request advice for sterility show that in at least 60% of one-child couples (numbering more than 100) married for more than 5 years, further conceptions were either desired or not deliberately prevented. Clinical experience extending to many hundreds of cases and investigations among working and middle-class women indicate that the small family (two children) is also often due to low fecundity and that fecundity tends to fall after the first or second confinement.

Data collected by individual clinicians and extending to over 4000 cases and by clinics show that birth control although applied at times by the great majority of the population is rarely (in about 5% of young couples) intended to procure permanent barrenness. Furthermore, effective methods of birth control are usually sought among the working class only by women who have had one or more children. One of the statistical expressions of this fact is that in one group (numbering more than 200 women) of regular users of birth control the average number of children was higher than in a comparable group of women using the same methods intermittently. Further investigations show that the contraceptive methods most commonly used by the industrial population are notoriously unreliable (coitus interruptus or soluble pessaries); their seeming success to which many working-class women attribute the small size of their families (e.g. 3 children in 15 years of marriage) can be shown to reflect lowered fecundity in at least a third of the cases (about 100) investigated.

* Members of the conference who signed the statement were Dr. V. B. Green-Armytage; Dr. Mary Barton; Prof. F. J. Browne, FRCOG; Mr. R. Christie-Brown, FRCOG; Miss Gladys Dodds, FRCOG; Dr. Greta Graff; Dr. A. Green; Mrs. Clare Harvey, ARCS; Dr. Margaret Hadley Jackson; Prof. R. W. Johnstone, FRCOG; Prof. W. C. W. Nixon, FRCS; Mr. C. Lane-Roberts, FRCOG; Dr. A. Sharman; Miss Margaret Moore White, FRCS; Mr. B. P. Wiesner, PH D; Mr. Kenneth Walker, FRCS.

Considering all available information it seems that in 60–90% of all barren and one-child couples lowered fecundity (depending on involuntary factors) is involved. Lowered fecundity is also often found in couples with 2 or more children. But its practical significance is less than in the one-child families because the use of effective methods of birth control increases with the size of the family. This widespread infecundity of the population is due in part to low female fecundity; particularly to conditions which tend to develop after confinements or miscarriages. But low reproductive power in men is very common; about 60% of husbands of childless women are either incapable of producing offspring or fail to attain a level of fecundity which would make conception easy (data from about 2000 cases, and from American findings). Similarly the husbands in one-child families are often of low fecundity. Examinations of about 100 volunteers (medical university students and professional men) confirms the view that average male fecundity is much lower than is commonly assumed. It appears to be definitely impaired in at least 1 out of 5 men examined. The men examined were mostly in good general health.

Nearly 90% of the middle-aged childless women (i.e. the last generation of married women) of the industrial groups interrogated in inquiries had accepted their fate without seeking specific help from any doctor or clinic. The remaining women sought advice; but in less than 5% was adequate or even relevant advice given. Middle-class women seek advice much more often. In the great majority of cases examinations and advice still tend to be limited to the wife; recognition of the common male responsibility is relatively rare.

On the other hand the few specialised clinics which at present give advice on sterility are sought out by increasing numbers of women. Of the present generation of potential mothers one Glasgow hospital which maintains a sterility clinic (for women only) admitted 303 cases in 1938; and 505 cases in 1942. A similar increase of attendances has also been seen in others of the few clinics in this country which supply adequate facilities for the diagnosis and treatment of sterility. The interest shown by childless men is of a less active kind, but refusal to undergo examination is rare in childless or child-poor men (under 5% in hospital practice). A consideration of all available data strongly suggests that the barren and the very small family reflect lower fecundity rather than excessive unwillingness to reproduce. This being so, no effort to solve the problem of the decline in the population can be considered satisfactory unless it recognises the necessity for providing facilities for the skilled diagnosis and treatment of all grades of infecundity.

CURRENT EXPERIENCE

Mr. R. CHRISTIE-BROWN said at the conference:

> Of 400 patients who have consulted me with reference to some gynæcological or obstetric condition, 100 of these were complaining of sterility. . . . In only 32 of these 100 cases did the husband submit his semen to test, and of these 12 were considered to be sterile.

Dr. MARGARET HADLEY JACKSON had found that the number of patients coming for advice on sterility to the Exeter Family Planning Association Clinic had increased rapidly over the past few years. She gave the following figures of cases treated:

1930	*'31*	*'32*	*'33*	*'34*	*'35*	*'36*	*'37*	*'38*	*'39*	*'40*	*'41*	*'42*	*'43**
0	0	1	0	1	1	6	10	11	12	15	23	30	51

* To July.

In the early years, she said, patients had come on their own account but for the last two or three years most of them had been sent by their own doctors. Of the 51 cases seen so far this year, 20 had used no form of birth control. Before attending the clinic patients had been married for an average of 5 yr. 2 mo. Less than 2% of husbands had refused to supply seminal specimens for examination; and rather more than 50% of these specimens had shown evidence of reduced fertility.

Miss M. MOORE-WHITE, FRCS, had obtained the following figures from a series of 100 consecutive cases where it had been possible to analyse the husband's semen. She noted that out of 162 new attendances in less than a month, 17% were seeking advice for sterility; only 1·8% had been married for less than 2 years.

		%
Nothing abnormal in either couple (no tubal obstruction, serious seminal changes or gross endocrine defects)		20
Women:	Fallopian tubes	
	Blocked	17
	Patent	52
	Rigid (no peristalsis)	24
	Obvious endocrine defects	7
Men:	Normal	43
	Impaired fertility	43
	Azoospermia	14

Dr. ALBERT SHARMAN reported that the total number of new patients complaining of primary sterility at the Royal Samaritan Hospital for Women, Glasgow, had risen from 392 in 1938, and 387 in 1939, to 505 in 1942 and 318 for the first six months of 1943.

In England Now

A Running Commentary by Peripatetic Correspondents

I AM working in a large municipal hospital. After more than thirty years service in a voluntary hospital with a medical school I find constant interest in noticing the differences between the two. They are not always easy to discern or to define, and yet all the time I am conscious of some subtle but definite difference in the atmosphere in which I work from that to which I have been so long accustomed. Some at least of the reasons for this are plain enough. First there is the physical environment. This straggling yellow brick building and its long stone-floored corridors are without charm, as they are without tradition. How much these two qualities affect us in our student days, as we pass through some great London or provincial medical school, it is hard to say. At the time we do not realise much the effect of these influences, but later in life we know that the influence was there and that it is still active. Does the Guy's man ever quite forget that his was the hospital of Astley Cooper and of Gull, or the Bart's man that Abernethy and Paget worked there, or the doctor from St. George's that he shared those precincts with Hunter and Jenner and Brodie? The municipal hospital has no such background. It is not the fault of the system on which it is run: it is merely the defect of youth, and youth is a fault which time cures. Doubtless, too, age will improve even the appearance of these institutions. Years will mellow the yellow brick. Flower beds and flower boxes may appear, grass plots be laid in the grounds. Another potent cause of the different feeling that one gets here from that engendered in the voluntary hospital is the absence of students. There is a lack of cheerfulness, let alone of gaiety—two emotions as precious to doctors as to their patients. There is, too, absence of that healthy rivalry set up by competing companies of dressers and clerks each jealous for the renown and performance of its own chief. This is replaced by an overwhelming obligation to conform to the many rules and regulations of the institution and a haunting fear lest one tread on the toes of a superior officer, or (more dreadful still) fail to comply with some rule, regulation or desire of the lay persons who are lords and masters of the hospital. One feels a lack of freedom. Worse still there is the impression that the primary object of the place is to put forth records that will satisfy the council. Records become more important than recoveries. Treatment may fail: that will not be observed by the ladies and gentlemen of the governing body. But what is written down is open to their inspection and the year's figures must not fall below those of former years.

Some of the sisters here are so hard put writing statements in triplicate that they barely find time to supervise their nurses and wards. At a time of paper shortage this hospital could still rival most government departments in the production of script that will be rarely if ever read. The fanatical inelastic devotion to routine rule and regulation has sometimes an unexpected and curious result. There is said to be a man here who drifted into an observation ward, having somehow avoided the proper mode of entry to the place. He was accredited to no medical officer. He made himself useful in the ward and the Sister liked him. It was nobody's duty to displace him; he had not been offici-

ally admitted so he could not be officially discharged. So far he has been an inmate for a mere fifteen years.

* * *

Dr. Gray's proposal, which its representatives adopted recently, that the BMA should seek to establish itself as a corporate body, reminds one naturally of the BBC where the parallel of the doctor-patient relationship persists unimpaired. Each licenced listener, paying his less-than-a-shilling-a-month towards the maintenance of the national radio service, still retains unchallenged the ancient Englishman's right to choose his own set—and his own programmes; but at this point in the parallel the doctors will demur. "Choose your own doctor? By gad, Sir, yes! But dammit, Madam, you *cannot* choose your own bottle of medicine, no matter how pretty it looks!" However . . .

* * *

The little lane leading to the great hospital where I go to work has on one side a high old brick wall and on the other a row of six tiny cottages joined together. A slanting tiled roof covers them, and each has white shutters to its little square-paned window, and an architrave of wood over its green door. The door itself is made in two parts, divided horizontally. Thus the little inmate can at will peer out of the upper part without opening the lower to an intruder. These six little houses are three hundred years old. They are a charity and are occupied by six little old women. The occupants must be old, to satisfy the terms of the bequest, and they must be little to meet the restriction of the houses. No large woman could exist happily in one of these dolls-houses. There is a front room which is parlour, dining, and bedroom, and beyond a tiny kitchen leads on to a diminutive garden. Here the little old women grow a few vegetables and a few simple cottage flowers. Beyond the garden flows a small stream. With this behind, and an unfrequented lane in front, the cottages provide as quiet a haven as could be wished. Yet my only conversation with any of the inhabitants was to take part in a quarrel. Human passions defy environment as well as old age. As I passed up the lane number Six was in difficulty with her doorkey. She was locked out of her little house and could not open the door. She appealed to me for help. Three doors down number Three could be seen peering over her half door. "She can do it," cried number Six, "she can let me in, but she is a wicked woman. Oh, she is a wicked woman, and I got her here. She is at that cottage through me and she is such a wicked woman." I walked along to wicked number Three who seemed an amiable old lady; she denied all knowledge of number Six's assertions, and especially that she could be of any help about the door. So I went back to number Six and suggested that she walk with me to whomever there was in charge of the cottages. She fell in with this readily enough and off we started, the old lady freely expostulating on the way on the iniquities of number Three. Poor number Six. A few days later when I passed her door no half pint of milk stood in its usual place outside; shutters were closed and door shut. Number Six now is a newcomer, just as old and small, but without apparent antipathy to number Three. What strange mental disturbance heralded the rapid decline and death of that old woman I am not enough of a neurologist to explain.

* * *

For years I had admired Kingsley Wood's devotion to running a legal aid bureau for poor persons in Shoreditch before I first came into personal contact with him over the National Health Insurance Bill, when he was indefatigable in helping Mr. Lloyd George to bring in the industrial insurance companies, for which Sir William Beveridge now has so little use. As chairman of the London Insurance Committee he was always friendly and always helpful when his interests did not differ from medical interests, and whenever we met he had a cheery word to say about the old fighting days. I never regarded him as a heavy-weight but I am bound to say that his subsequent career modified that opinion. He was of course handicapped by his cherubic appearance and by his voice, but he triumphed over these difficulties. It has been said that he was a friend of the little man and rather inclined to distrust experts, particularly medical experts; that is a pretty sound opinion and I would add for myself that he was actuated not only by ambition but by a genuine desire to do good public work. At one thing he was transcendently good: he introduced orderliness into every department he entered. And that I expect explains why our lift attendant was enthusiastic about the way everyone, including himself, had been fairly taxed.

* * *

For some time past I have been carrying out a miniature Gallup poll on my own by putting to my friends the question, which of the national services apart from the fighting services will have the strongest claim on the Treasury after the war? No-one has yet categorically put the health services first. Some people think housing, but the strongest group seems to be in favour of transport. I cannot help thinking the time has now come when we should get down to practical work. Assuming that the allocation from the Treasury will be strictly limited (not to mention that from local rates), in what order should we start our reforms? It is very important we should have clear ideas about this.

MEDICAL DEFENCE UNION

Dr. JAMES FENTON, addressing the annual meeting on Sept. 21, said that the abbreviated report was not an indication that the work of defence had grown smaller, or that members of the council had given less service. Notwithstanding difficulties of travel and pressure of professional work, the meetings of the council and its committees had never been better attended. Omission from the report of the useful comment on medico-legal problems was simply a measure of the council's desire to assist the Government's war effort in saving paper. The war had not indeed reduced the number of allegations made against members of our profession; litigation continued on an increasing scale, and the public were increasingly insistent on their rights. Hundreds of members had been interviewed during the year, and thousands of letters of advice written. Dr. Fenton referred to "the Spackman case" in which the union had challenged the procedure followed by the General Medical Council, which took the case to the House of Lords where it was settled in favour of Dr. Spackman, who had now been reinstated on the Medical Register. The decision of the House of Lords would, he felt sure, be quoted through the years to come as a benefit not merely to Dr. Spackman, but to the profession as a whole, and he paid tribute to Mr. Hempson (solicitor) and Mr. Dickens (counsel) who remained steadfast in their opinion from beginning to end. "I wish," he went on, "to add the opinion of myself and others of our council that the General Medical Council is anxious to be fair to all who appear before it on any charge whatever. We are closely acquainted with the work of the GMC, and we hold the view that it is well fitted to investigate professional matters. For myself I would prefer to be judged by this distinguished body of medical men, familiar with all the dangers and difficulties peculiar to medical practice, than by a civil court. Let me say that the MDU did not in any way object to the GMC going to the House of Lords. We appreciated entirely their point of view; there was merely a difference of opinion by the legal experts who advised the two bodies, and it was felt on all hands that it should be solved once and for all. We have always been happy to work in close harmony with the GMC, and nothing has arisen between us in this case to interfere with our relationship."

Dr. Fenton concluded with two warnings. The doctors who are coming back to practise, taking the place of colleagues who have been called up, may have terminated their membership of the union on retirement, and may not now be in full benefit. Their first duty to themselves and their families is to satisfy themselves that they are once more registered as members. Better still if doctors hesitated before resigning membership on joining the Army or retiring, for legal questions arise and charges are made months or even years after the alleged negligence occurred. And secondly, doctors must not assume that membership of the union will be unnecessary if the state takes control of the profession. The state will certainly not accept liability for their errors or omissions.

Following the meeting the elected members of council reappointed Dr. Fenton president for the session 1943–44, Mr. E. D. D. Davis treasurer, and Dr. Roche Lynch chairman of committee. Mr. Ivor Back's name was added to the list of vice-presidents.

Letters to the Editor

SCIENTIFIC FREEDOM IN GOVERNMENT SERVICE

SIR,—In your issue of Oct. 2 a correspondent, signing himself or herself Argus, states that "a doctor working in the Civil Service is, in fact, effectively gagged; he can say or write only what has official approval." Speaking for the Post Office, which is numerically the largest department of the Civil Service and, in ordinary times, as large as, or larger than, all other departments of the Civil Service combined, I should like to say that this gives a wholly misleading impression. The Post Office, as the largest and oldest industrial medical service in the country and probably the world, has kept accurate working life-time sick records of all its employees of all ranks for nearly a hundred years. These have made possible long-distance large-scale observations, many of which have been published. To mention only two, it was largely upon published Post Office medical experience that the non-pathological nature of adolescent albuminuria was established and accepted. More recently, it was largely upon published Post Office medical experience that the futility of quarantine in the case of healthy contacts with the ordinary zymotic diseases was demonstrated. Further, the researches and medical experience of the Post Office have been freely open to—and largely made use of by—welfare and medical officers in outside industry; and everybody in the Post Office has been only too glad that this should be the case.

There has certainly been no gagging of its medical staff, either in the way of research or publication. I cannot speak with equal knowledge of other departments of the Civil Service. I can imagine it possible, for instance, that a medical research into the toxicology of some substance used in industry or munition-making might be temporarily withheld from general publication for quite valid reasons of state, especially in war-time. This is not to comment upon any possible future development of hospital or general medical practice. But I should be surprised to learn from your correspondent that, apart from such possible instances as I have suggested, any valuable piece of medical research work had been deliberately suppressed by the head—permanent or ministerial—of any Civil Service Department.

London, E.C.1. H. H. BASHFORD.

GOING UNDERGROUND

SIR,—Sufficient coal is not being got to maintain the war effort and keep us warm. Men are being returned to the mines from other industries, and miners prosecuted for absenteeism. Recently the best part of a coal-field has been on strike in Nottinghamshire because a surface worker was sent to prison for refusing to go down the pit. Dr. Culpin has drawn attention to the psychological aspects, but there is ever a more important point of view.

While all this is going on, complicated discussions are proceeding about the establishment of a State Medical Service (to which I am, incidentally, whole-heartedly opposed), and it is said that it should be the function of the medical profession to lead the way in the improvement of social conditions, housing, food, and work. Is it not strange that the medical profession has remained so silent on the present mining troubles? If it ever is to fulfil the function of leading the way to a New World, then doctors should speak now.

Apart from your excellent leader (*Lancet*, 1942, i, 417), I can remember no pronouncement on the miner's burden, but there must be doctors far better acquainted with the mining industry than I, who could quickly point out the root of the present troubles. If this letter succeeds in stimulating them to speech or to writing, its object will be attained.

It seems almost pathetic that the two basic industries of this country, the Merchant Navy and coal, should have been, and are, so neglected. Today the average miner says, and means, "My child shall not go down the pit." Why? Because he knows the appalling working conditions, the risks to life and limb, and the hopelessness of an injured man obtaining work elsewhere. Any improvement in miners' working conditions, or any advance in wages, have only been obtained after a bitter struggle between employees and employer. Surely, before miners are prosecuted for absenteeism, attempts should be made to improve the working conditions of the miner and the conditions under which he lives in the mining villages, and to restore trust between the two sides of the industry.

Perhaps this is being done. If it is, let us hear about it, and let us hear the views of those doctors who are in close contact with mines and miners.

Southwell, Notts. T. A. LLOYD DAVIES.

INTRAPERITONEAL SULPHONAMIDES

SIR,—Your leading article of Sept. 25 will, I hope, stimulate British surgeons to greater interest in a valuable adjunct to the treatment of the infected peritoneum. Little has been published in this country on the use of sulphonamides in the peritoneal cavity and more experimental work is necessary to establish such treatment. I have employed sulphapyridine in most of my cases; sulphanilamide and sulphathiazole have not given me nearly such good results in cases of intraperitoneal infection. The inevitably contaminated abdominal wound has nearly always healed by first intention in my experience which now extends over two and a half years. The risk of jaundice or other intoxication appears to be negligible, provided enough fluid is taken, and the peritoneal dose need not be supplemented by oral or other routes. Doses up to 25 g. are safe and the presence of the drug in the blood-stream seven days after administration testifies to its slow absorption. But, as you rightly emphasise, this new chemotherapy is not a panacea for all ills and must not replace scrupulous surgical technique.

Aylesbury. R. H. GARDINER.

MITES IN TABLE SALT

SIR,—A woman in this district purchased a packet of table salt which she took home and from it filled the salt-cellar. She thought that somehow she had inadvertently mixed pepper with the salt, until to her horror she saw the pepper heaving and drifting along the surface. There were thousands upon thousands of mites, tyroglyphidæ of some sort, but how or why they invaded the salt is a mystery. Various species, all much alike, do at times infest cheese, flour, sugar, dried fruits and so on, but I can find no record of them being found in salt. They are pale, soft-bodied and eyeless with prominent chelicerae and a few long bristles, the larger ones with faint magenta staining of the head and feet. No other package of salt had been invaded and each had apparently been packed ready for sale by the manufacturer or wholesaler in grease-proof paper bags enclosed in cardboard containers. This season has been beneficent to all pests and it may have encouraged an adventurous order of the arachnida to a too dangerous exploration as the mites all died in the salt two days afterwards.

A. G. G. THOMPSON,
Lambeth, S.W.2. Medical Officer of Health.

DR. WILLIAM PASTEUR

SIR,—In the obituary tributes to the late Dr. William Pasteur in your issue of Sept. 18, his chief claim on posterity—namely, that he discovered, described and put on the map of medicine for all time the condition known as massive collapse of the lung—is not made clear. I am sure that all those who served with or under him would wish that this, his outstanding achievement, should be permanently associated with his name.

Harley Street, W.1. VICTOR BONNEY.

FIRST AID FOR FRACTURE OF LOWER JAW

SIR,—Lieut.-Colonel Moir calls attention to the need of knowledge on first aid for fracture of the lower jaw, and the points he makes will be agreed to by maxillo-facial surgeons. I would suggest two brief modifications.

1. To the words "Irregularity in the line of the teeth" I would like to add "possibly only detectable when the jaws are approximated."

2. I would like it made clear that when a casualty is

carried by stretcher he *must* be carried feet first in order that the rear stretcher-bearer may constantly observe his condition.

Oxford. D. S. HAYTON-WILLIAMS.

INFLAMMABILITY OF TRICHLORETHYLENE

Mr. C. LANGTON HEWER writes:—In a paper read last May before the section of anæsthetics, RSM, I stated that "trichlorethylene vapour will not burn or explode if mixed in any proportion with air, oxygen or nitrous oxide." It appears, from research recently carried out by the Bureau of Mines, Pittsburg, USA, that this statement is true only if the temperature does not exceed 25·5° C. [78° F.]. At higher temperatures, if the vapour is mixed with air enriched with oxygen, or with pure oxygen, the mixture can under certain conditions become inflammable. So far as I know, there are no data relative to the inflammability of nitrous oxide, oxygen, trichlorethylene mixtures at high temperatures, but the matter is being thoroughly investigated by I.C.I. Ltd. Pending the publication of their report it would seem wise to use 'Trilene' mixed with air only, if there is any risk of a source of ignition coming into contact with the anæsthetic gases.

Corrigendum.—In our issue of July 10, p. 58, the letter signed Thomas James was in fact sent by Squadron-Leader Theodore A. James, MB.

Obituary

RICHARD AUSTIN FREEMAN

MRCS, LSA

Dr. Austin Freeman, who died at Gravesend in his 82nd year, qualified in 1886 from the Middlesex Hospital, where he was house-physician. For twenty years, on and off, he worked in Africa on the Gold Coast, accompanying a mission to Ashanti and Bontuku as medical officer, naturalist and surveyor, and later being appointed a member of the Anglo-German Boundary Commission for Togoland. In 1892, after being invalided home with blackwater fever, he entered general practice and later became medical officer to Holloway Prison and acting assistant MO to the Port of London Authority. In 1901 his health forced him to give up medicine for authorship and some of "Dr. Thorndyke's" best years followed. He served in command of a field ambulance in the RAMC (T) during the last war, remaining on the active list till 1922. His works included a book on Ashanti and Jarman, and *Social Decay and Regeneration* published in 1921; but it is in Dr. Thorndyke's laboratory that his colleagues will miss him. He was a freeman of the Society of Apothecaries and was elected to the livery in 1929. He married in 1887 Annie Elizabeth Edwards; they had two sons.

ALAN FORD SMITH

B M OXFD, M R C P; CAPTAIN RAMC

THE death of Dr. A. Ford Smith while serving in the Middle East is announced. He entered the London Hospital with an open scholarship in 1934 from Lincoln College, Oxford, after gaining a first in the honours school of physiology, and as a student gained many hospital prizes. He was a student demonstrator of anatomy in the medical college, and after qualifying in 1937 he became house-physician to the medical unit and to the department of physical medicine, and assistant in the pathology department. Later with a Nuffield research scholarship he returned to Oxford to work under Professor Witts until on the outbreak of war he joined the RAMC. J. B. writes: "Human beings were Tommy Ford Smith's chief interest and being so human himself he made friends in all walks of life. He looked only for simplicity of heart in his fellows and had no use for pretentiousness. He could master in an hour a subject with which his friends might wrestle for days, but he never minded when like vultures we used to pick his brains. He seemed to have read everything, but he carried his knowledge of literature and art with easy grace and no trace of pomposity. The intelligence, gaiety and charm that were housed in Fordie's lanky and picturesque form will be remembered by all who knew him."

MEDICAL RELIEF IN FREED EUROPE

THE "challenge to medical sciences" which occupied countries will offer when they are freed was discussed in London last Saturday at a conference convened by the Association of Scientific Workers, with Dr. DOUGLAS MCCLEAN in the chair.

Dr. A. MARTEAU, who lately left Belgium, said that within three months of the Nazi occupation the situation in that country was worse than at the end of 1917. Today people who are not wealthy—i.e., the large majority—subsisted on a daily ration of ½ lb. bread, a few potatoes, very little in the way of vegetables, and exceptionally a tiny piece of meat. The result was a general loss of weight, lower resistance to physical and mental strain and to infection, and a reduction in the birth-rate. Reassuring statistics published under the authority of the Germans or of quislings were valueless. The only means of true relief was victory: to send food to Belgium now would ultimately be to help Germany, though an exception might possibly be considered for the children. To bring relief after the war a few units from the USA and Britain would not suffice. Help must be found in the country itself, and distribution should be entrusted to the local authorities once these have been purged. The political aspect of this major problem must not be allowed to paralyse all action. In certain quarters political considerations and social prejudice predominated. Belgian resistance, however, had not given way to threats or oppression; nor would it be disposed to accept, in any form, a dictatorship of corned beef and condensed milk. Much had been said of unconditional surrender. The peoples starved by Hitler would accept only one kind of relief—unconditional relief.

Dr. V. KRUTA, of Czechoslovakia, spoke of the urgent need to provide food for people in concentration and other camps and ghettos who would be faced with starvation on the collapse of the Nazi administration. The enormous movements of population would create many problems.

Dr. A. P. CAWADIAS explained how the worst of the famine in Greece was relieved by supplies of British and American food after April 1942. But the effects of famine, he said, do not cease with the arrival of food. An epidemic of typhus in Athens gave warning of what was to come, and continued malnutrition had brought a terrible increase in disease, including malaria, tuberculosis and hunger œdema. Against the consequences of malnutrition "we shall have to fight for a whole generation."

Prof. A. SARKISOV described the devastation wrought in the USSR by the invaders and the measures taken to meet the immense need arising from it.

Prof. J. R. MARRACK, speaking on present plans, said that relief was not confined to food; its object should be to set peoples on their feet again, and this meant that railways and factories must be set working and that livestock, seeds and raw materials must be supplied—on a basis of lend-lease rather than charity. After the last war surplus stocks of food were sent to Europe, and this benefited American farmers. But these supplies of foods that happened to be surplus were inadequate, and physiological needs were now better understood. The actual amounts that would be required were small in comparison with total consumption in, for example, the USA. Rationing could provide enough of certain foods that otherwise would be short. Relief might prove to be the beginning of an internationally controlled consumers' economy.

OPHTHALMOLOGICAL SOCIETY OF EGYPT.—To encourage scientific ophthalmic work this society has instituted a prize which will be awarded each year for the best essay submitted at its congress. The competition is open to all members of the society who have been in practice for less than 20 years. Further particulars may be had from the secretary, 42, Kasr El Ainy Street, Cairo.

ROYAL SANITARY INSTITUTE.—A meeting will be held at the Royal Leamington Spa on Saturday, Oct. 16, at 10.30 AM, when Mr. E. H. Doubleday, regional officer for the Ministry of Town and Country Planning, will read a paper on town and country planning and health.

"RELIGIO MEDICI"

A TERCENTENARY TRIBUTE

DOUGLAS GUTHRIE, M D EDIN, F R C S E

Sir Thomas Browne's *Religio Medici* (The Religion of a Physician) can be classed neither as a medical nor as a scientific work, yet it occupies a unique place in literature because of the perennial freshness of its message and the delightful manner and style in which that message is presented. It has had many imitators. All manner of "religios" have appeared, pertaining to numerous callings. Thus we have *Religio Clerici*, *Religio Jurisprudentis* and such-like publications; but none of them can match the original model.

Many men of letters have paid homage to Sir Thomas Browne. Coleridge, Lamb, Lowell, Johnson and many another has acknowledged his influence, and in our own day Sir William Osler has done much to revive the peculiar attraction which the *Religio* must ever hold for the medical man. Needless to say, Browne has also had his critics since the fashion was set by the dreary Aberdonian philosopher, Alexander Ross, whose *Medicus Medicatus or the Physician's Religion cured by a lenitive or gentle Potion* only added to Browne's popularity. Sir Kenelm Digby's *Observations upon Religio Medici* did still more, and thereby hangs the tale of the publication which may be here retold.

THE STORY OF THE FIRST EDITION

Dr. Thomas Browne, the son of a mercer of Cheapside, London, had studied in Oxford, spent three years in the medical schools of Padua, Montpellier and Leyden, had commenced practice in Norwich, and had married Dorothy Mileham, before the authentic edition of *Religio Medici* appeared in 1643. Originally written at Shipden Hall, Halifax, just after the author's return from the Continent, it was not intended for the press but was composed as "a sort of private diary of the soul." The writer was still young. "My life, it is a miracle of thirty years," he observes in one place, and in another, "nor hath my pulse beat thirty years." The manuscript was circulated among friends, and frequently copied, as a number of manuscripts still exist although none in Browne's handwriting. The publication of such a document was a temptation too great to be resisted; one of the manuscripts reached a printer in 1642 and was "most imperfectly and surreptitiously published." Worse was to follow, when a copy of the pirated edition was bought by the forceful and versatile Sir Kenelm Digby, then in prison for a political offence. Within 24 hours, if we are to believe him, the prisoner had written and published a review and criticism which caught the public imagination. Browne was now obliged to take action. With characteristic liberality he supplied to the same publisher the corrected edition and thus, early in 1643, *Religio Medici* became available for all readers. The alterations do not appear to have been very extensive. Even the frontispiece of the "surreptitious" edition was used, and has been reproduced many times. It represented a man, falling from a high cliff, caught and rescued in mid-air by a hand emerging from a cloud in the heavens, and it bears the legend "*a cælo salus.*"

THE "RELIGIO" AND ITS MESSAGE

It is not easy to explain in a few sentences the nature of *Religio Medici*; indeed it is by no means easy to read, for it is a work which must be studied and pondered for many a day before its magic and fascination captures the average reader.

The very title of the book was a paradox when it appeared; the medicus of that day was held to be a sceptic in matters of religion, and the new learning, already in full flood on the Continent and gradually extending to Britain, tended to widen the gulf between religion and science. Yet Browne sets out to state his argument in favour of a wide and liberal interpretation of Christianity, for "those who do confine the Church of God either to particular Nations, Churches or Families, have made it far narrower than our Saviour ever meant it." At the outset the work claims that he "dare without usurpation assume the honourable title of Christian"; but, he continues, "I borrow not the rules of my Religion from Rome or Geneva, but the dictates of my own reason." His views are "not wrung from speculations and subtilties, but from common sense and observation; not pickt from the leaves of any Author, but bred amongst the weeds and tares of mine own brain." He has no antipathy to "Turks, Infidels and Jews," but, for himself, he finds that "there is no Church whose every part so squares unto my Conscience," so "consonant unto reason" and so "framed to my particular Devotion, as the Church of England."

Having said this, he is not prepared to argue further, for he has "no Genius to disputes in Religion," however argumentative he may be in other matters. "In Philosophy, where Truth seems double-fac'd, there is no man more Paradoxical than my self; but in Divinity I love to keep the Road; and, though not in an implicite, yet an humble faith, follow the great wheel of the Church." "As for those wingy Mysteries in Divinity, and airy subtleties in Religion, which have unhinged the brains of better heads, they never stretched the Pia Mater of mine." Like many another man of Science he keeps his Religion in a separate compartment, for "many things are true in Divinity which are neither inducible by reason nor confirmable by sense." Of course he was faced by problems, but he was content merely to state them and to believe that "there is some other hand that twines the thread of life other than that of Nature. I am sure we do not err if we say it is the hand of God." For instance: "For the first chapters of Genesis, I must confess a great deal of obscurity," and "I would gladly know how Moses with an actual fire calcined or burnt the Golden Calf unto powder, for that mystical metal of Gold, exposed to the violence of fire, grows onely hot, and liquefies, but consumeth not."

We are not surprised to find Browne sceptical of Hell, a grim reality in his time. "I thank God," he writes, "that I was never afraid of Hell, nor ever grew pale at the description of that place." "I can hardly think there was ever any scared into Heaven; they go the fairest way to Heaven that would serve God without a Hell," Nor can he "dream that there should be at the last day any Judicial proceeding or calling to the bar as indeed the Scripture seems to imply, and literal Commentators do conceive."

So futile is religious argument, that he considers it would be for the benefit of learning, were it possible to limit the literature of religion to "a few and solid Authors; and to condemn to the fire those swarms and millions of Rhapsodies, begotten only to distract and abuse the weaker judgments of Scholars, and to maintain the trade and mystery of Typographers." One shudders to think how Browne would have regarded the books of today.

As a medical man he must needs refer to the mystery of the soul, stating that "amongst all those rare discoveries and curious pieces I find in the Fabrick of Man, there is no Organ or Instrument for the rational Soul; for in the brain there is not anything of moment more than I can discover in the crany of a beast, and this is an argument of the inorganity of the Soul. Thus we are men, and we know not how; there is something in us that can be without us, and will be after us; though it is strange that it hath no history what it was before us, nor cannot tell how it entered in us."

The Medicus makes further reference to his anatomical studies when he refers to those patients, so well known to every medical practitioner, who "think health an appurtenance unto life, and quarrel with their constitutions for being sick?"; "but I," writes Dr. Browne, "that have examined the parts of man, and know upon what tender filaments that Fabrick hangs, do wonder that we are not always so; and do thank my God that we can die but once." Not content to contemplate such mysteries of Nature as the Tides, the Nile floods, and the Magnetic Ode, he "studied to match and parallel those in the more obvious pieces of Nature, which without further travel I can do in the Cosmography of myself." "We carry with us the wonders we seek without us: there is all Africa and her prodigies in us. . . ." Extending his observations to the animal world, he remarks that "there are no Grotesques in Nature," and "no deformity in any kind or species of creature whatsoever." It is not surprising that he was more intrigued by the habits of insects than

by such "prodigious pieces of Nature, Whales, Elephants and Dromidaries." There was "more curious Mathematicks" in bees, ants, and spiders, and "the civility of these little Citizens more neatly sets forth the Wisdom of their Maker."

In the second part of *Religio Medici* the author turns from the theme of Faith to that of Charity.

Browne had a truly international outlook which must have been as rare in the 17th century as it is today. His was "a constitution so general, that it consorts and sympathiseth with all things. I have no antipathy, or rather Idiosyncrasie, in dyet, humour, air, any thing. I wonder not at the French for their dishes of Frogs, Snails and Toadstools, . . . but being amongst them, make them my common Viands." "At the sight of a Toad or Viper, I find in me no desire to take up a stone and destroy them." "National repugnances do not touch me, nor do I behold with prejudice the French, Italian, Spanish or Dutch." This he writes at a time when "whole Nations miscall each other by opprobious Epithets" and when scholars wielded pens which "carried farther and gave a louder report than Thunder." "All places, all airs, make unto me one Countrey; I am in England every where, and under any Meridian."

How could men judge aright, with such imperfect knowledge? "No man," answers Browne, "can justly censure or condemn another, because indeed no man truly knows another." How many of us could echo such noble sentiments? Thus he continues, condemning intellectual snobbery, philosophising on sleep and dreams, and discussing the voice of Conscience; "another man within me that's angry with me, rebukes, commands and dastards me."

Browne's experience as a physician leads him to pray, "Let me be sick my self, if sometimes the malady of my patient be not a disease unto me," and to feel "not only ashamed but heartily sorry, that there are diseases incurable; yet not for my own sake, or that they are beyond my Art, but for the general cause and sake of humanity."

LATER LIFE IN NORWICH

No series of extracts from *Religio Medici* can convey the charm and interest of the complete work. It is like a piece of music, which must be played in its entirety to be fully appreciated. Of course Browne had his faults. We find it hard to understand how so saintly a man could write "I have ever believed, and do now know, that there are witches," and could even supply the evidence upon which two unfortunate women accused of witchcraft were condemned to death at Lancashire Assizes in 1635. Perhaps one should rather marvel that in other respects the author of *Religio Medici* held views far ahead of his time. As so often happens, the *Religio*, his first work, was also his greatest. His second, *Pseudodoxia Epidemica* was published in 1646. It was an inquiry into certain "vulgar errors" and is full of quaint and picturesque argument. Did moles possess eyes? Did swans sing whilst dying? Were the legs of the badger shorter on one side so that it could run on the side of a hill? Could the ostrich digest iron? Such are a few of the "errors" discussed in this curious book.

Two other books followed in 1658, *Urn-burial* and *The Garden of Cyrus*. Dr. Browne was a physician of high repute, his large medical practice including such well-known families as the L'Estranges and the Pastons and extending far beyond the city of Norwich. He was also a keen naturalist and archæologist and it was natural that he should be informed of a number of cinerary urns near Walsingham. Yet no-one can regard his book, *Hydriotaphia, Urn-Burial* as a contribution to archæology. The urns are simply the text of a magnificent discourse upon man's mortality. It is strangely ironical that the skull of Sir Thomas Browne, he who had that horror of being "knav'd out of our graves," was on view in the museum of the Norfolk and Norwich Hospital from 1840 until 1922, when it was decently reinterred in the church of St. Peter Mancroft. Browne himself had written, "Who knows the fate of his bones, or how often he is to be buried?" Today he would have been a strong supporter of cremation.

The Garden of Cyrus contains as little of horticulture as *Urn-Burial* does of archæology. Obsessed by the geometrical form known as the "quincunx," the writer wanders on in tantalising fashion, often becoming almost unintelligible, until at the end he rises to the very summit of English prose in a grand peroration.

Of the closing years of Browne's life we have little information. For 46 years he practised in Norwich, but his fame extended throughout the world of letters. He lived in troublous times and was a good Royalist, but he was too wise to dabble in politics. Throughout all the current turmoil, he and his wife Dorothy enjoyed long and happy lives. Edward, the eldest of their ten children, attained a distinction almost equal to that of his father. He travelled far and widely in Europe, and wrote an account of his journeyings, then became a leading physician in London, a fellow of the Royal Society and physician to the king. It was that king who knighted the father during a visit to Norwich in 1671. Charles II was about to confer this honour upon the Mayor, but that honest man informed the king that a more worthy recipient of the royal favour was present in the person of the famous doctor, who thereupon became Sir Thomas Browne.

He died 14 years later, on his 77th birthday. Some twenty editions of the *Religio* had appeared during his lifetime and the book had been translated into Latin, Dutch, German, French and Italian. It has been reprinted many times since then. Although it proclaimed no new discovery, nor even any new idea or method, the influence which it exercised in its day has steadily grown and it continues to attract an ever-increasing circle of devoted readers.

Appointments

COWAN, W. J., MB EDIN.: RSO at Preston Royal Infirmary.

DUNLOP, E. M. N., LRCPE: orthopædic registrar at Warwick Hospital.

GOOD, W. C., FRCSI: RSO at St. Mark's Hospital, London.

HALBERSTAEDTER, MAX, MB LOND., DMR: chief asst. to the radio-therapeutic research dept. at St. Bartholomew's Hospital, London.

HARRIS, E. D., MB LOND., FRCS: temp. surgeon to the ear, nose and throat dept. of the Hampstead General and North-West London Hospital.

ILLINGWORTH-LAW, I., MA CAMB., MRCS: surgical registrar at the Royal Northern Hospital, London.

LEWERS, H. B., DSO, OBE, MB MELB.: examining factory surgeon for Ilfracombe, Devon.

MACLAREN, A. H., MB ABERD.: resident orthopædic and fracture officer at the General Hospital, Nottingham.

MARSHALL, STANLEY, MD LOND.: temp. pathologist at the Bolingbroke Hospital, London.

MCCANN, J. J., MB LOND., MRCP: temp. deputy medical superintendent (class IV) at Pinewood Sanatorium (LCC).

PIGGOT, A. P., MRCS: acting medical superintendent, St. James's Hospital (LCC).

ROBERTSON, J. S., MD ABERD., DPH: divisional medical officer, LCC (mass radiography unit).

ROWLING, DOROTHY E., MB LEEDS: RSO at the Prince of Wales's Hospital, Plymouth.

Births, Marriages and Deaths

BIRTHS

BARBER.—On Sept. 27, at Great Dunmow, Essex, the wife of Dr. Geoffrey Barber—a son.

BREWER.—On Sept. 28, at Luton, Beds, the wife of Dr. H. F. Brewer—a daughter.

CAWTHORNE.—On Sept. 23, at Upminster, the wife of Squadron-Leader J. E. Cawthorne, MRCS—a son.

DICKS.—On Sept. 25, at Harpenden, the wife of Lieut.-Colonel H. V. Dicks, RAMC—a son.

NEUSTATTER.—On Sept. 24, at Beaconsfield, the wife of Major W. Lindesay Neustatter, RAMC—a daughter.

RICHARDS.—On Sept. 30, the wife of Dr. A. M. Richards, of Oxford—a son.

MARRIAGES

CAMPBELL—OSBORN.—On Sept. 17, in Edinburgh, Ian Campbell, captain RAMC, to Joan Carnegie Osborn, 2/sub., ATS.

REID—CARMICHAEL.—On Oct. 2, at Liverpool, Hugh Reid, FRCS, to Sheila Carmichael, MB, captain RAMC.

REITER—MAUGHAN.—On Sept. 25, Tiberius Reiter, MD, to Nancy Maughan.

DEATHS

ALLEN.—On Sept. 26, in Liverpool, James Davison Colquhoun Allen, MB EDIN., of Hoylake and formerly of Bath, aged 76.

COWEN.—On Sept 25, George Hebb Cowen, MB LOND., FRCS, of Newbury, Berks, formerly of Southampton, aged 71.

FRY.—On Sept. 24, at Bexhill, Augustine Cradock Fry, MA CAMB., MRCS, formerly of Stone, Staffs, aged 75.

FULTON.—On Sept. 28, Adam Fulton, MB RUI, of Harrogate, formerly of Nottingham, aged 76.

HEY.—On Sept. 28, at Ripon, Samuel Hey, MRCS, aged 73.

PASK.—On Oct. 4, at The House, Wrightington Hospital, near Wigan, Edward Henry Allon Pask, MD LOND., aged 59.

PRIESTLEY.—On Sept. 21, in Leeds, John Overend Priestley, MRCS, DMRE, formerly of Ballycastle, Antrim.

Notes and News

THE FAMILY DOCTOR AND PREVENTIVE MEDICINE

SPEAKING at Westminster Hospital medical school on Oct. 4 Mr. ERNEST BROWN, Minister of Health, spoke on the relation of the individual doctor to the organisation of preventive medicine. "Some of the problems involved," he said, "raise broad questions of social policy—housing, agriculture, foreign trade, taxation. On these the individual doctor as citizen has his part to play, a part which in his case cannot fail to be important owing to the professional weight attaching to his views. (And I would put in a plea that the doctor should not ignore or contemn his duties as a citizen in this context. Doctors like other men are, or ought to be, political animals). But as a doctor even more than as a citizen he must be closely concerned with the promotion of health. Some of the profession will, of course, be in contact as experts with environmental problems—the medical officer of health, the bacteriologist. What I have in mind, however, is rather the general practitioner, the family doctor, and his relationship to prevention. Here I am sure there is one reform we must work for, and that is to bring together again the family doctor and those personal preventive services like child welfare and the care of pregnancy, which have tended to develop along increasingly divergent courses. That is one reason why it is so essential to plan for a comprehensive service which provides a family doctor for those many families that have hitherto been without one. Another reason in my view is that the general practitioner can and will have a most important rôle in putting across to the individual citizen the principles of positive health. We are gradually realising in this country the importance of health education, and we are gradually learning more effective ways of catching the ear and the eye of the public at large. But in bringing home to the individual parent or adolescent or child the principles of healthy living there is no method so effective as that of personal contact and individual advice, and no adviser so effective as the family doctor. My hope for the nation's health in the future is therefore that, on the firm foundation of comprehensive curative medical facilities available to every citizen, we shall be able to build a health service with the positive promotion of health as its foremost object; and that the medical profession, no longer engaged almost wholly in a ceaseless struggle to check the ravages of disease, will be free for the first time to occupy its rightful place as the guide of the community in the paths of the truly healthy life."

Royal College of Surgeons of England

Arnott and Erasmus Wilson demonstrations and museum lecture demonstrations are to be held at the college, Lincoln's Inn Fields, London, W.C.2, on weekdays at 4 PM from Oct. 18 to Nov. 5. Prof. A. J. E. Cave is to speak on cerebral and cranial veins, the portal vein and the portal-systemic anastomoses, the major lymphatic trunks, the development and anatomy of the palate, the naso-pharynx and eustachian tube, anatomy of the axilla, the carotid sheath and other fascial structures, tendons and tendon sheaths, and the anatomy of intra-articular structures. Mr. L. E. C. Norbury will also speak on multiple primary malignant growths with special reference to the colon and rectum, Mr. R. Davies-Colley on certain states of bone absorption, Mr. C. E. Shattock on tumours of the kidney, and Surgeon Rear-Admiral Wakeley on tumours of the alimentary tract.

University of Aberdeen

At a graduation on Sept. 29 the following degrees were conferred:

MB, CAB.—William B. Burnett (with first-class honours); R. N. Johnston and M. R. Milne (with second-class honours); J. R. Anderson, R. J. Anderson, Eba C. Baird, Sheila M. Baker, J. B. Bittiner, Hugh Brebner, G. W. D. Campbell, Mary E. Chalmers, G. C. Chessor, Charles K. Clark, Catherine M. Coull, I. O. Cowan, M. M. Craig, Thelma C. Cruickshank, Sheila E. Dalgliesh, W. J. Dawson, R. C. M. Dingwall, G. A. Findlay, D. A. Forbes, A. G. Fraser, I. A. Fraser, Joseph C. Gardiner, Helen E. Gordon, J. B. Gordon-Russell, Charles Grant, Mona Griffin, F. W. Henderson, Valentine M. Husband, I. D. Innes, Kathleen M. Knox, Nancy Laing, Peter Leslie, P. G. McBoyle, D. J. McCombie, Mary G. McDonald, Margaret J. McHardy, A. E. Macintosh, D. G. Mackay, N. R. Mackay, D. N. Mackinnon, A. I. Maclean, W. F. Macleod, Antoinette M. H. MacMahon, Ishbel M. Macrae, J. L. A. McVicker, D. W. Mathieson, Elizabeth H. Milne, C. G. R. More, R. E. P. Nutten, R. A. Peat, H. M. Raffan Sheila T. Ritchie, Marguerite M. Scott, W. G. Shiach, R. G. Simpson, W. D. Sinclair, J. A. M. Smith, A. L. Speirs, A. J. Spence, Laura B. C. Thompson, I. G. Thomson, W. G. Todd and D. E. Walker.

Medical Honours

The following awards have lately been made to medical men:

GM.—Surgeon Lieutenant P. R. C. Evans, MB LOND., RNVR, for gallantry in services to the wounded after his ship had been damaged by an explosion. Enduring great pain and with both his ankles broken, Evans continued to tend the wounded for many hours.

DSC.—Surgeon Lieutenant R. H. Jones, MB, RNVR, for courage and resolution in pressing home a successful attack on enemy forces in enemy coastal waters.

RNVR Officers' Decoration.—Surgeon Commander W. T. R. Chapman, MRCS, and Surgeon Lieut.-Commander S. B. Levy, LRCP.

Mentioned in despatches.—Group-Captain C. J. S. O'Malley, MB LOND., W. J. G. Walker, MRCS, Wing-Commanders R. M. Outfin, LMSSA, and H. L. Willcox, MB NZ, Squadron-Leaders, J. A. Mains, LRCPE, M. O. Richardson, MRCS, P. A. Gimson, MRCS, and J. F. Houlihan, MB NUI.

The King has given authority to Dr. S. Avery Jones, medical officer in the Arab Legion, to wear the insignia of the fourth class of the order of El Istiqlal which has been conferred on him by the Amir of Trans-Jordan.

The President of the Republic of Poland has appointed Wing-Commander H. P. R. Smith MB CAMB., RAF, to be an officer of the Order of Polonia Restituta.

Medical Prisoners of War

The following officers have been posted as prisoners of war:

RAF Medical Branch (in Japanese hands).—Wing-Commander Donald Magrath, MB BIRM., Flight-Lieutenants D. A. Duthie, MB EDIN., F. A. Forbes, MB ABERD., C. B. I. Willey, BM OXFD, F. R. Philps, MB LOND., A. F. Rutherford, MB EDIN., R. R. McSwiney, MB LOND., L. C. Liddell, MB ABERD., B. A. Stoll, MRCS., H. J. Knox, MB BELF., R. G. Blackledge, BM OXFD, John Simpson, MB., P. J. Connolly, LRCPI, B. L. N. Morgan, MRCS., John Lillie, MB BELF., R. J. S. Wilson, MB DUBL., F. W. Parke, MB DUBL. and Maurice Kinmonth, MB LOND.

RAMC.—Lieut.-Colonel J. C. Collins, MRCS, Captain E. H. Markby, MRCS, Lieutenant E. C. Vardy, MD DURH., Captain R. B. Wallace, DSO, MC, MB GLASG., and Captain R. B. C. Welsh, MB EDIN.

University of Istanbul

Dr. Tevfik Sağlam has been appointed rector of the University of Istanbul.

Sağlam, who was born in 1882 in Istanbul, graduated from Askeri Tibbiye (Military Medical School) when he was 21. He served as army hospital doctor in both the Balkan and the World War and was promoted to the rank of general. After working as chief doctor in Gülhane Hastahanesi and as inspector of internal diseases during the Istiklal Harbi (War of Independence) he became a professor in the faculty of medicine. He gave up teaching in 1934 to practise as a specialist of internal diseases till last year he became third ordinary professor of internal diseases in the faculty of medicine at Istanbul.

Paddington Medical Society

A meeting will be held on Tuesday, Oct. 12, at 8.45 PM, at St. Mary's Hospital, Paddington, W.2, when there will be a discussion on problems confronting the medical and pharmaceutical professions in war-time.

Infectious Disease in England and Wales

WEEK ENDED SEPT. 25

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 2772; whooping-cough, 1480; diphtheria, 757; paratyphoid, 14; typhoid, 3; measles (excluding rubella), 466; pneumonia (primary or influenzal), 356; puerperal pyrexia, 149; cerebrospinal fever, 49; poliomyelitis, 8; polio-encephalitis, 2; encephalitis lethargica, 4; dysentery, 270; ophthalmia neonatorum, 70. No case of cholera, plague or typhus fever was notified during the week.

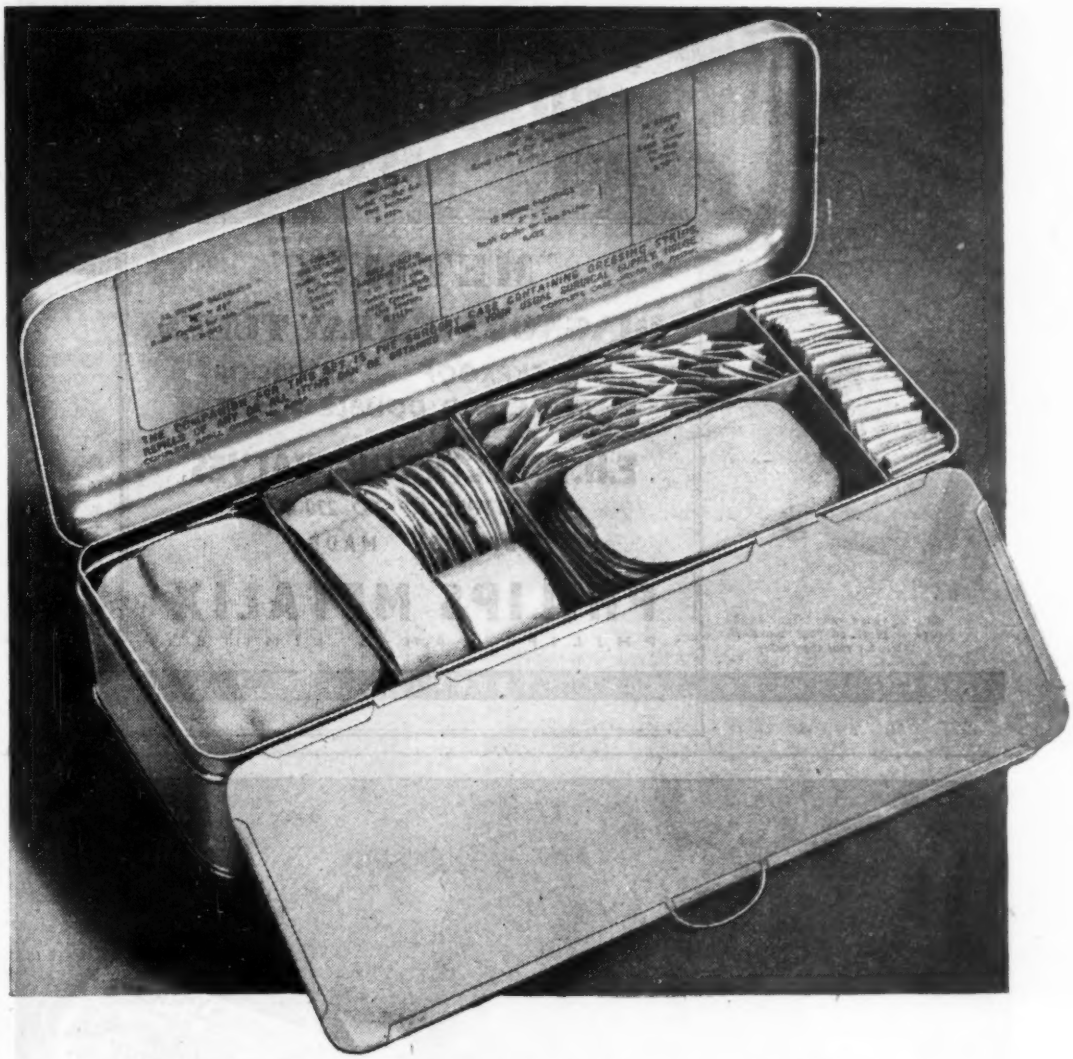
The number of civilian and service sick in the Infectious Hospitals of the London County Council on Sept. 22 was 1828. During the previous week the following cases were admitted: scarlet fever, 246; diphtheria, 44; measles, 12; whooping-cough, 39.

Deaths.—In 126 great towns there were no deaths from measles, scarlet fever or enteric fever, 13 (1) from whooping-cough, 11 (2) from diphtheria, 61 (10) from diarrhœa and enteritis under two years, and 9 (1) from influenza. The figures in parentheses are those for London itself.

Liverpool and Birmingham each reported 5 deaths from diarrhœa.

The number of stillbirths notified during the week was 197 (corresponding to a rate of 31 per thousand total births), including 23 in London.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.



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An increasing number of medical men and women are forming the opinion that the Brooks Automatic Air Cushion Pad is the best possible mechanical device for retaining hernia. Being automatic, it follows every movement of the body, giving security under all conditions—yet without the "gouging" pressure associated with rigid-type pads. Once adjusted, it will not easily slip or leave its proper position.

It is for these reasons, and because every Brooks Appliance is specially made to individual measurements by skilled and highly trained fitters, that we co-operate in so many hernia cases. *When writing for details please enclose 2d. stamp to conform with government regulations.*

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Telephone : HOLBORN 4813
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DOCTORS RECOMMEND
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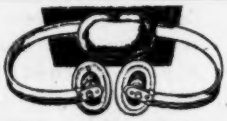

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British Postgraduate Medical School.
(UNIVERSITY OF LONDON.)

DIARY FOR WEEK ENDING 15TH OCTOBER, 1943.—*Daily*, 10 A.M. to 4 P.M., Medical Clinics, Surgical Clinics and Operations, Obstetrics and Gynæcological Clinics and Operations. 1.30 P.M., Post-mortems. *Tuesday*, 10 A.M., Paediatric Clinic, Dr. R. Lightwood; 11 A.M., Gynæcological Clinic, Mr. Green Armytage; 2 P.M., "Genetics and Medical Science," Dr. H. Gruneberg. *Wednesday*, 11.30 A.M., Clinico-Pathological Conference (Medical). *Thursday*, 2 P.M., Dermatological Clinic, Dr. R. T. Brain. *Friday*, 12.15 P.M., Clinico-Pathological Conference (Surgical); 2 P.M., Clinico-Pathological Conference (Gynæcological); 2 P.M., Neurological Ward Clinic, Mr. G. C. Knight; 2 P.M., Sterility Clinic, Mr. Green Armytage.

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BRITISH POSTGRADUATE MEDICAL SCHOOL
(UNIVERSITY OF LONDON)

WAR SURGERY OF THE EXTREMITIES
18th–22nd October, 1943

Monday, 18th Oct.	10 A.M.	Blood Transfusion.. ..	Dr. J. F. Loutit, M.R.C.P., M.R.C.S., L.R.C.P.
	11.15 A.M.	Administrative Problems in War Surgery.	
	2 P.M.	Traumatic Arterial Spasm	Mr. Sol. M. Cohen, M.A., F.R.C.S.
	3.15 P.M.	Primary Care of Nerve Injuries.	Dr. R. B. Zachary, M.R.C.S., L.R.C.P.
Tuesday, 19th Oct.	10 A.M.	Wounds of the Extremities with or without Fractures.	Mr. St. J. D. G. Buxton, F.R.C.S.
	1.30 P.M.	Radiological Investigation of Wounds of the Extremities.	Major J. Duncan-White, M.B., Ch.B., D.M.R.E.
	2.30 P.M.	Some General Principles of War Surgery of the Limbs.	Prof. G. Grey-Turner, F.R.C.S., M.R.C.S., L.R.C.P., F.A.C.S., F.R.A.C.S.
Wednesday, 20th Oct.	10 A.M.	Secondary Hæmorrhage ..	Mr. Sol. M. Cohen, M.A., F.R.C.S.
	11.15 A.M.	Traumatic Aneurysm ..	Mr. Sol. M. Cohen, M.A., F.R.C.S.
	1.45 P.M.	Amputations	Mr. Jenner Verrall, F.R.C.S., M.R.C.S., L.R.C.P.
	2.45 P.M.	Recent Advances in the Treatment of War Wounds.	Dr. J. Trueta.
Thursday, 21st Oct.	10 A.M.	Infections	Prof. A. A. Miles, F.R.C.P., M.R.C.S., L.R.C.P.
	11.15 A.M.	Shock	Dr. J. McMichael, M.D., F.R.C.P., F.R.S.E.
	1.30 P.M.	Tetanus	Dr. Leslie Cole, M.D., F.R.C.P.
	2.30 P.M.	Recent War Experiences of Wounds of the Extremities.	Mr. St. J. D. G. Buxton, F.R.C.S.
Friday, 22nd Oct.	10 A.M.	Wounds of Joints	Wing Commander I. Lawson Dick, F.R.C.S.E.
	11.15 A.M.	War Burns	Dr. E. E. Lewis, F.R.C.S.
	2 P.M.	Injuries of the Hands ..	Mr. J. N. Barron, M.B., Ch.B., F.R.C.S.
	3 P.M.	Gas Gangrene and Other Anaerobic Infections.	Mr. G. R. Mullally, M.C., M.S., F.R.C.S.

The fee for the Course will be one guinea, but in certain cases the fees for serving Officers recommended by their Director-Generals are paid by their Military Authorities. Applications for admission should be sent to the DEAN, British Postgraduate Medical School, Ducane-road, Shepherds Bush, W.12.

Further War Courses will commence as follows:—

THE SURGICAL CARE OF THE SOLDIER IN TRAINING.	1ST–5TH NOVEMBER, 1943
WAR SURGERY OF THE ABDOMEN ..	15TH–19TH NOVEMBER, 1943
RECENT ADVANCES IN THE MEDICAL ASPECTS OF WAR INJURIES.	29TH NOVEMBER–3RD DECEMBER, 1943

Royal College of Surgeons of England,
Lincoln's Inn-fields, London, W.C.2.

NOTICE OF ANNUAL MEETING OF FELLOWS AND MEMBERS.

Notice is hereby given that it is proposed to hold a Meeting of Fellows and Members at the College in Lincoln's Inn-fields on THURSDAY, 18TH NOVEMBER, 1943, at 2.30 P.M., and that a Report from the Council will be laid before the Meeting. Fellows and Members can obtain copies of the Report on application to the Secretary, and can, if they so desire, have their names placed on the list of those to whom the Report is sent annually. Motions to be brought forward at the Meeting must be signed by the mover, or by the mover and other Fellows and Members, and must be received by the Secretary not later than the 8th November. A copy of the Agenda will be issued on or after the 13th November to any Fellow or Member who may apply for one.

9th October, 1943. KENNEDY CASSELS, Secretary.

National Hospital, Queen Square, W.C.1

A series of Twelve Clinical Demonstrations of Neurological cases will be given at the above Hospital on TUESDAYS at 3.30 PM, and on SATURDAYS at 10.30 AM from OCTOBER 19th to NOVEMBER 27th. The Demonstrations will be open free to Medical Graduates and Senior Undergraduates.

J. PURDON MARTIN, Dean of the Medical School.

L. M. S. S. A.

FINAL EXAMINATION: SURGERY, November 8th, December 6th, 1943, January 10th, 1944; MEDICINE, PATHOLOGY, November 15th, December 13th, 1943, January 17th, 1944; MIDWIFERY, November 16th, December 14th, 1943, January 18th, 1944.

For regulations apply REGISTRAR, Apothecaries' Hall, Black Friars-lane, London, E.C.4.

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SPEECH DEFECTS
RESIDENT AND NON-RESIDENT PUPILS.
Full Particulars upon request to:
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London, W.C.1
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PRIVATE MENTAL HOME for Nervous and Mental Illness. All forms of treatment available. Fees from 4 gns. per week upwards according to requirements. Vacancies occasionally exist at reduced fees on the recommendation of the patient's own physician.
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For LADIES and GENTLEMEN of Unsound Mind.
Terms moderate. Apply to Resident Medical Superintendent.
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The Pioneer Hospital, opened 1796, for the humane treatment of those suffering from Nervous and Mental Disorder

This Hospital of 200 beds, administered by a Committee of the Society of Friends, combines what is best in the investigation and treatment of nervous illness with a sympathetic and friendly atmosphere. Last year 166 patients were admitted, of whom 138 were voluntary cases.

Much curative work is accomplished in our mental hospitals to-day and the recovery rate compares very favourably with that of our general hospitals.

For information and terms of admission apply to:—
The Physician Superintendent,
ARTHUR POOL, M.R.C.P.
(Telephone: York 3618)

ST. ANDREW'S HOSPITAL
FOR NERVOUS AND MENTAL DISORDERS

NORTHAMPTON

PRESIDENT: THE MOST HON. THE MARQUESS OF EXETER, K.G., C.M.G., A.D.C.

MEDICAL SUPERINTENDENT: THOMAS TENNENT, M.D., F.R.C.P., D.P.H., D.P.M.

This Registered Hospital is situated in 130 acres of park and pleasure grounds. Voluntary patients, who are suffering from incipient mental disorders or who wish to prevent recurrent attacks of mental trouble; temporary patients, and certified patients of both sexes are received for treatment. Careful clinical, bio-chemical, bacteriological, and pathological examinations. Private rooms with special nurses, male or female, in the Hospital or in one of the numerous villas in the grounds of the various branches can be provided.

WANTAGE HOUSE

This is a Reception Hospital in detached grounds with a separate entrance, to which patients can be admitted. It is equipped with all the apparatus for the complete investigation and treatment of Mental and Nervous Disorders by the most modern methods; insulin treatment is available for suitable cases. It contains special departments for hydrotherapy by various methods, including Turkish and Russian baths, the prolonged immersion bath, Vichy Douche, Scotch Douche, Electrical baths, Plombieres treatment, etc. There is an Operating Theatre, a Dental Surgery, an X-Ray Room, an Ultra-violet Apparatus, and a Department for Diathermy and High-frequency treatment. It also contains Laboratories for bio-chemical, bacteriological, and pathological research. Psychotherapeutic treatment is employed when indicated.

MOULTON PARK

Two miles from the Main Hospital there are several branch establishments and villas situated in a park and farm of 650 acres. Milk, meat, fruit, and vegetables are supplied to the Hospital from the farm, gardens, and orchards of Moulton Park. Occupational therapy is a feature of this branch, and patients are given every facility for occupying themselves in farming, gardening, and fruit growing.

BRYN-Y-NEUADD HALL

The seaside house of St. Andrew's Hospital is beautifully situated in a Park of 330 acres, at Llanfairfechan, amidst the finest scenery in North Wales. On the North-West side of the Estate a mile of sea coast forms the boundary. Patients may visit this branch for a short seaside change or for longer periods. The Hospital has its own private bathing house on the seashore. There is trout-fishing in the park.

At all the branches of the Hospital there are cricket grounds, football and hockey grounds, lawn tennis courts (grass and hard courts), croquet grounds, golf courses, and bowling greens. Ladies and gentlemen have their own gardens, and facilities are provided for handicrafts, such as carpentry, etc.

For terms and further particulars apply to the Medical Superintendent (TELEPHONE: No. 2356 and 2357 Northampton), who can be seen in London by appointment.

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A Private Clinic, the first in Great Britain, for investigation and treatment of all forms of disease, except infectious and mental

There is a steel and concrete Air Raid Shelter with heating and a lift to all floors

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Completely detached Villas for mild cases. Voluntary Patients received. Twenty acres of grounds; own garden produce. Hard and grass tennis courts, putting greens, Recreation Hall with Badminton Court, and all indoor amusements. Occupational therapy, Calisthenics, Actino-therapy, prolonged immersion baths, shock and also modified insulin treatment. Chapel.

Senior Physician, Dr. HUBERT JAMES NORMAN, assisted by a resident Medical Staff and visiting Consultants

An Illustrated Prospectus giving fees, which are strictly moderate, may be obtained upon application to the Secretary

The Convalescent Branch is HOVE VILLA, BRIGHTON and is 200 ft. above sea-level

PECKHAM HOUSE, 112, Peckham Road, London, S.E.15

Telegrams: "Alleviated, London" — **Telephone: Rodney 2641-2642**

A Private Mental Hospital, for Ladies and Gentlemen suffering from Nervous and Mental Illness, where the amenities of a comfortable home are combined with full investigation and every well-established modern treatment.

Terms from 3½ guineas weekly.

Illustrated Prospectus may be obtained from the Physician Superintendent.

COURT HALL, KENTON, near EXETER

FOR THE TREATMENT OF EIGHT LADIES, VOLUNTARY, TEMPORARY AND CERTIFIED PATIENTS

CLIFFDEN, TEIGNMOUTH

FOR EARLY AND CONVALESCENT CASES — Recreational Therapies are held daily by skilled Leaders

The house stands high with spacious balconies and extensive views of the South Devon Coast. Beautiful garden. Own Dairy in 25 acres. Private road to beach

There is also a charming house, EBWORTHY, MANATON, DARTMOOR, situated in 20 acres, 1100 ft. up for bracing moorland air

Resident Physicians—BERTHA M. MULES, M.D., B.S. ANNE S. MULES, M.R.C.S., L.R.C.P. — *Telephones*—STARCROSS 259 and TEIGNMOUTH 28°

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FORMBY-BY-THE-SEA Nr. LIVERPOOL

Specially built and licensed for the care and treatment of a limited number of Ladies and Gentlemen suffering from NERVOUS and MENTAL breakdown. Voluntary and certified patients received. Ladies also admitted as Temporary Patients without certification. Terms moderate. *Apply*, RESIDENT PHYSICIAN, who may be seen in Liverpool, by appointment. *Tel. No.* 8 *Formby.*

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A Registered Hospital for MENTAL DISEASES, and its Seaside Branch, GLAN-Y-DON, Colwyn Bay, N. Wales

THE object of this Hospital is to provide the most efficient means for the treatment and care of PATIENTS of BOTH SEXES suffering from MENTAL and NERVOUS DISEASES. The Hospital is governed by a Committee appointed by the Trustees of the Manchester Royal Infirmary. VOLUNTARY, TEMPORARY, AND CERTIFIED PATIENTS RECEIVED

For Terms and further information apply to the MEDICAL SUPERINTENDENT *Telephone:* GATLEY 2231

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A Private Hospital for the Care and Treatment of those of both sexes suffering from MENTAL DISORDERS

Extensive grounds. Detached Villas. Chapel. Garden Produce from own gardens. Terms very moderate.

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standing in 12 acres of ornamental grounds, with separate villas, tennis courts, etc. Patients or Boarders may visit the Home by arrangement.

Illustrated Brochure on application to the Medical Superintendent, The Old Manor, Salisbury.

HAYDOCK LODGE,

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For the reception and treatment of PRIVATE PATIENTS of both sexes of the UPPER AND MIDDLE CLASSES suffering from Mental and Nervous Disorders, Alcoholism and Drug Addiction, either voluntarily, temporarily, or under certificate. Patients are classified in separate buildings according to their mental condition. Situated in park and grounds of 400 acres. Self-supported by its own farm and gardens in which patients are encouraged to occupy themselves. Every facility for indoor and outdoor recreation. For terms, prospectus, etc., apply MEDICAL SUPERINTENDENT. *Telephone:* Ashton-in-Makerfield 7311. *Telegraphic Address:* Wootton, Ashton-in-Makerfield.

CRICHTON ROYAL, DUMFRIES

FOR NERVOUS AND MENTAL DISORDERS

Cases of Alcoholism and Drug Addiction are admitted. Every facility for individual treatment on the most modern lines. As the Hospital is well endowed, terms are exceptionally moderate.

Medical Certificates given anywhere in the British Isles are valid for admission of patients.

Physician Superintendent: P. K. MCCOWAN, J.P., M.D., F.R.C.P., D.P.M., Barrister-at-Law. Tel.: Dumfries 1119.

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For MENTAL DEFECTIVES of all ages

Training under medical supervision. Schools, Farm, Trade Workshops, Recreations. Fees £125 to £375 p.a. Election by votes of subscribers at reduced terms for necessitous trainable cases.

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Open Air Occupation and Recreation for Patients, Farming, Gardening, Football, Cricket, Tennis, Bowls, etc. School recognised by Board of Education.

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Telephone: PINNER 234.

A Private Hospital for the Treatment and Care of Mental and Nervous Illnesses in both Sexes.

A modern country house, 12 miles from Marble Arch, in attractive and secluded surroundings. Fees from 10 guineas per week inclusive. Cases under Certificate, Voluntary and Temporary Patients received for treatment.

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Ladies and Gentlemen received for treatment under certificates, and without certificates as either VOLUNTARY or TEMPORARY PATIENTS,

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For Mental Cases with or without Certificates.

Ordinary Terms: Five Guineas per week (including Separate Bedrooms for all suitable cases without extra charge).

For forms of admission, &c., apply to the Resident Physician, CEDRIC W. BOWER.

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On the Cotswold Hills, seven miles from Cheltenham, Stroud and Gloucester. Fully equipped for the treatment of all forms of Tuberculosis.

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A Private Home for the Care and Treatment of a limited number of LADIES with Mental and Nervous Disorders. Certified, Voluntary, and Temporary Patients received. Mansion with 12 acres of ground (See *Medical Directory*, p. 2441.) Apply Resident Physician. Telephone: Little Chalfont 2046. Station: Chalfont and Latimer.

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Examining Surgeons:

FACTORIES ACT, 1937.

The following appointment as Examining Surgeon under the Factories Act, 1937, is vacant.

Applications should be sent to the CHIEF INSPECTOR OF FACTORIES, 28, Broadway, London, S.W.1.

District	*County*	*Latest date for receipt of application*
WINTERTON ..	LINCOLN ..	19TH OCTOBER, 1943

King Edward Memorial Hospital,

Ealing, W.13.

Applications are invited from registered medical practitioners for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (Gynæcological, &c.) (A), vacant 1st November. Six months' appointment. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply.

Applications, stating age, nationality, qualifications with dates, and details of experience, together with copies of two recent testimonials, should be sent immediately to—

R. A. MICKELWRIGHT, House Governor.

Hampstead General Hospital,

Haverstock Hill, N.W.3.

The Council of Management is prepared to receive applications for the office of TEMPORARY HONORARY GYNÆCOLOGIST to OUT-PATIENTS. Candidates must be Fellows of a College of Surgeons and a Member of the Royal College or Obstetricians and Gynæcologists, and must be ineligible for military service.

Applications, stating age, qualifications, and experience, with copies of three testimonials, must reach the undersigned by 21st October, from whom full particulars of the appointment may be obtained.

By Order of the Council of Management,

KENNETH A. F. MILES, House Governor.

Hampstead General Hospital,
Haverstock Hill, N.W.3.

Applications are invited from registered medical practitioners, Male and Female, including R and W practitioners who now hold A posts, for the appointment of CASUALTY SURGICAL OFFICER (B2) at OUT-PATIENT DEPARTMENT, Camden Town, N.W.1. Salary £100 per annum, plus allowance at £50 p.a. for duties in connexion with First-aid Post established there, tenable for six months. Practitioners within three months of qualification and liable under National Service Acts may also apply, when appointment will be temporarily down-graded to A.

Applications on the prescribed form, with copies of three testimonials, to be returned not later than 21st October.

KENNETH A. F. MILES, House Governor.

The Royal Cancer Hospital (Free)
(Incorporated under Royal Charter),
Fulham-road, London, S.W.3.

X-RAY DIAGNOSTIC DEPARTMENT.

Applications are invited for the post of DIRECTOR of this new Department. The appointment to be part time and involves attendances on five half-day sessions a week. Salary £750 per annum. The Director shall be entitled to receive fees for work carried out in connexion with private patients attending the Hospital under other members of the staff, but shall not be permitted to see private patients referred to him direct from outside sources. The teaching of X-ray diagnosis shall form an important part of his duties. The appointment will be for the duration of the war and terminable within twelve months of the conclusion of hostilities.

Applications, to be made on a form which will be supplied by the Secretary, together with copies of three recent testimonials, should be sent to the Secretary not later than the first post on Wednesday, 3rd November, 1943.

CLEMENT COBBOLD, Secretary.

The Royal Cancer Hospital (Free)
(Incorporated under Royal Charter),
Fulham-road, London, S.W.3.

Applications are invited for the post of HOUSE SURGEON (A). Salary at the rate of £200 per annum, with full residential emoluments. The appointment is subject to rules, a copy of which can be obtained from the Secretary. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months, to commence duty on the 1st December, 1943.

Applications to be made on a form which will be supplied by the Secretary, with copies only of not more than three recent testimonials, to be sent to the Secretary not later than the first post on Wednesday, 13th October, 1943.

CLEMENT COBBOLD, Secretary.

The Royal Cancer Hospital (Free)
(Incorporated under Royal Charter),
Fulham-road, London, S.W.3.

Applications are invited for the post of RESEARCH HISTOLOGIST (Non-medical) in the PATHOLOGICAL DEPARTMENT of the Hospital. The appointment is for twelve months in the first instance and subject to rules, a copy of which can be obtained from the Secretary. Salary £700 to £800 per annum, according to experience.

Applications to be made on a form which will be supplied by the Secretary, together with copies of three recent testimonials, should be sent to the Secretary not later than the first post on Wednesday, 13th October, 1943.

CLEMENT COBBOLD, Secretary.

Dreadnought Seamen's Hospital,
Greenwich, S.E.10.
(Including Tropical Diseases cases.)

Applications are invited from Male registered medical practitioners for the appointment of HOUSE PHYSICIAN (B2), vacant 1st November. Salary is at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications, stating age, qualifications with dates, and previous experience, accompanied by copies of recent testimonials, to be sent on or before 22nd October to: F. A. LYON, Seamen's Hospital Society, Greenwich, S.E.10. Secretary.

London County Council.

Applications are invited from registered medical practitioners for the undermentioned positions :—

TEMPORARY SENIOR ASSISTANT MEDICAL OFFICER (B1), with medical duties at QUEEN MARY'S HOSPITAL FOR CHILDREN, Carshalton, Surrey.

TEMPORARY DEPUTY MEDICAL SUPERINTENDENT (Class IV) (B1) at COLINDALE HOSPITAL, The Hyde, N.W.9. Experience in pulmonary tuberculosis essential.

Salary £500–£25–£600 a year, with board, lodging, and washing. Married quarters are not available.

Applications from R practitioners now holding B1 posts cannot be considered unless they have been rejected by the R.A.M.C.

Application form obtainable (stamped addressed foolscap envelope necessary) from MEDICAL OFFICER OF HEALTH (S.D.2), County Hall, S.E.1, returnable by 25th October, 1943.

Canvassing disqualifies.

London County Council.

TEMPORARY ASSISTANT DISTRICT MEDICAL OFFICERS required for :—

(*a*) AREA IV, DISTRICT A (part of the Borough of Hampstead). Provisional salary £130 a year (including allowance for use of surgery).

(*b*) AREAS V AND VI, DISTRICT B (the Borough of Chelsea). Provisional salary £175 a year.

Persons engaged required to carry out duties prescribed by Public Assistance Order, 1930, and to reside in or near district. Remuneration and conditions subject to review.

The vacancy in Area IV, District A, exists during the absence of the appointed Assistant District Medical Officer on war service.

Medical practitioners required as TEMPORARY PART-TIME VISITING MEDICAL OFFICERS, daily visit (except Sundays) and emergencies, at :—

(*a*) ST. LUKE'S HOSPITAL, Sydney-street, Chelsea, S.W.3 (two positions). Salary £200 a year.

(*b*) ST. BENEDICT'S HOSPITAL, Church-lane, Tooting, S.W.17. Salary £250 a year.

(*c*) CHELSEA INSTITUTION, Dovehouse-street, S.W.3. Salary £250 a year.

Application form obtainable (stamped addressed foolscap envelope necessary) from MEDICAL OFFICER OF HEALTH (S.D.2), County Hall, S.E.1, returnable by 25th October, 1943.

Canvassing disqualifies.

British Postgraduate Medical School.
(UNIVERSITY OF LONDON.)

Applications are invited from registered medical practitioners, Male and Female, for the appointments of HOUSE PHYSICIAN (A), one vacant 1st November, 1943, and one 1st December, 1943. The appointments are for six months. The salary is at the rate of £105 per annum, plus full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply.

Applications, together with copies of three recent testimonials, should be made to the DEAN, British Postgraduate Medical School, Ducane-road, W.12, not later than 15th October for the appointment in November and not later than 30th October, 1943, for the appointment in December.

British Postgraduate Medical School.
(UNIVERSITY OF LONDON.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), vacant 30th October, 1943. The appointment is for six months. The salary is at the rate of £105 per annum, plus full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply.

Applications, together with copies of three recent testimonials, should be made to the DEAN, British Postgraduate Medical School, Ducane-road, W.12, not later than Friday, 15th October, 1943.

Connaught Hospital, E.17.
(For Walthamstow, Wanstead, Leyton, and Chingford.)

Applications are invited for the appointment of TEMPORARY HONORARY SURGEON to the EAR, NOSE, AND THROAT DEPARTMENT. Candidates must be Fellows of one of the Royal Colleges of Surgeons.

Applications, together with copies of three testimonials, should be received by the 31st October, 1943. The Hospital is one of 118 Beds, including private wards.

R. HALTON HARRISON, General Secretary.

Hospital of St. John and St. Elizabeth
60, Grove End-road, N.W.8.

Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE SURGEON (A), vacant 1st November, 1943. Appointment will be for a period of six months. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply. F. DUDLEY HOBBS, B.A., Secretary.

Borough of Wimbledon.

Applications are invited from suitably qualified persons, Men or Women, for the appointment of TEMPORARY ASSISTANT MEDICAL OFFICER OF HEALTH AND TEMPORARY ASSISTANT SCHOOL MEDICAL OFFICER. The commencing salary will be between £650 and £700 per annum, according to qualifications and experience. A car allowance at the rate of £40 per annum will be paid in addition or transport provided.

Further particulars and forms of application may be obtained from the Medical Officer of Health, to whom applications should be returned by first post on Monday, 25th October, 1943.

EDWIN M. NEAVE, Town Clerk.

Town Hall, Wimbledon, S.W.19.

Weir Hospital,
Weir-road, Balham, London, S.W.12.

Locum RESIDENT MEDICAL OFFICER (Female) required from 1st November. Apply for particulars to the HONORARY SECRETARY-SUPERINTENDENT.

East Ham Memorial Hospital,
Shrewsbury-road, E.7. (131 Beds.)

Applications are invited for the post of TEMPORARY HONORARY OPHTHALMIC SURGEON. Candidates must be engaged solely in Ophthalmology and have had considerable operative experience. Preference will be given to candidates who hold the diploma of F.R.C.S.

Applications, stating full particulars, should be forwarded to the undersigned immediately. Candidates will be required to send copies of their application and testimonials to, and call upon, members of the Honorary Medical Staff.

REGINALD PERRY, Secretary-Superintendent.

King George Hospital, Ilford.

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant 1st January, 1944. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding diploma of F.R.C.S. Salary is at the rate of £550 per annum. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, with copies of testimonials, should be sent not later than 6th November to—

G. AUSTIN HEPWORTH, Secretary and Superintendent.

King George Hospital, Ilford.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), vacant 1st November, 1943. The appointment will be for a period of six months. Salary is at the rate of £120 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply.

Forms of application can be obtained from the undersigned, to whom they should be returned not later than 26th October.

G. AUSTIN HEPWORTH, Secretary and Superintendent.

Cheltenham, Gloucester and County
CHILD GUIDANCE CLINIC.

Applications are invited from registered medical practitioners for the appointment of MEDICAL DIRECTOR of the Cheltenham and County Child Guidance Clinic, which is administered by a Joint Committee of the Gloucestershire County Council, the Gloucester City Council and the Cheltenham Borough Council.

Applicants should be specially experienced in Psychiatry, particularly in the psychiatric treatment of children, and be thoroughly conversant with the conduct of Child Guidance Clinics.

The salary will be £500 per annum, and opportunity will be afforded to engage in consulting private practice.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to the candidate passing the necessary medical examination.

Forms of application and further particulars of the appointment may be obtained from the SECRETARY FOR EDUCATION, Shire Hall, Gloucester, to whom application, with copies of three recent testimonials, should be sent not later than 25th October, 1943.

Northumberland County Council.
HEXHAM EMERGENCY HOSPITAL. (640 Beds.)

Applications are invited from qualified medical practitioners, preferably holding a higher qualification in surgery, for the post of RESIDENT SURGICAL OFFICER (B1). Duties are mainly orthopædic, but include a certain amount of general surgery. Salary is at the rate of £550 per annum, together with full residential emoluments, and is terminable by one month's notice on either side. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications with dates, experience, and details of previous appointments, and accompanied by copies of three recent testimonials, should be sent immediately to: J. B. TILLEY, County Medical Officer.

County Hall, Newcastle upon Tyne, 1.

County Borough of Bury.

Applications are invited from registered medical practitioners for the position of Whole-time DEPUTY MEDICAL OFFICER OF HEALTH (Temporary). Duties will include those at a Tuberculosis Dispensary in the diagnosis and treatment of venereal disease cases, and in school medical work. Preference will be given to candidates possessing experience necessary to carry out the above-mentioned duties. The salary will be at the rate of £750 per annum, rising to £850 per annum by annual increments of £25. The appointment will be subject to six weeks' notice on either side, and may be subject also to the provisions of the Local Government Superannuation Act, 1937, for which purpose the successful candidate will be required to pass a medical examination.

Applications, stating age, qualifications, experience, liability for military service, medical fitness, and position as regards deferment, and accompanied by copies of not more than three recent testimonials, should be forwarded to the undersigned not later than 15th October, 1943.

There is no special form of application.

H. D. A. ROBERTSON, Town Clerk.

Municipal Offices, Bank-street, Bury, 1st October, 1943.

The King Edward VII Welsh National
MEMORIAL ASSOCIATION.

Applications are invited from duly registered medical practitioners (Male or Female) for AREA ASSISTANT TUBERCULOSIS OFFICER (two vacancies). The appointments are temporary and open to review after the war. The scale of salary is £500 per annum, rising by annual increments of £25 to £700. The Local Government Act, 1937, is applicable to the Association. Candidates should preferably have had at least six months' special training in tuberculosis, and also eighteen months' experience in general clinical work, of which not less than six months should have been spent in a hospital as resident officer in charge of beds occupied by general medical or surgical cases. A knowledge of Welsh is desirable but not essential.

Applications, stating age, qualifications, experience, and full information as to liability for military service, medical fitness, and position as regards deferment, together with names of three referees, should be received by Wednesday, 13th October.

NORMAN TATTERSALL, Principal Medical Officer.

Memorial Offices, Cathays Park, Cardiff.

The King Edward VII Welsh National
MEMORIAL ASSOCIATION.

Applications are invited from registered medical practitioners (Male or Female, single) for the appointment of TEMPORARY ASSISTANT RESIDENT MEDICAL OFFICER (B1) at the ADELINA PATTI HOSPITAL, Craig-y-nos, Swansea Valley (114 Beds for the treatment of pulmonary tuberculosis in men and women, and surgical tuberculosis in children). Applicants should have held house appointments and had institutional experience in the treatment of pulmonary tuberculosis. Salary £350 per annum, plus full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications, and experience, with particulars as to liability for military service and medical fitness, together with copies of three recent testimonials, should reach the undersigned as soon as possible.

NORMAN TATTERSALL, Principal Medical Officer.

Memorial Offices, Cathays Park, Cardiff.

The King Edward VII Welsh National
MEMORIAL ASSOCIATION.

Applications are invited from registered medical practitioners, Male and Female, for the appointments undermentioned :—

JUNIOR RESIDENT MEDICAL OFFICER (B2), two vacancies, at the SOUTH WALES SANATORIUM, Talgarth, Brecs. (286 Beds for pulmonary tuberculosis in male patients), the CEFN MABLY HOSPITAL, near St. Mellons, Mon (112 Beds for pulmonary tuberculosis in male and female patients). Salary at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise it will be for a period of one year.

Applications to be sent as soon as possible to—

NORMAN TATTERSALL, Principal Medical Officer.

Memorial Offices, Cathays Park, Cardiff.

City of Liverpool.

Applications are invited for the appointment of a Full-time JUNIOR MEDICAL PATHOLOGIST at the ALDER HEY EMERGENCY HOSPITAL (1316 Beds) which also deals with material from the Broadgreen Emergency Hospital (700 Beds). Salary at the rate of £650 per annum (non-resident), together with a cost-of-living bonus amounting, at the present time, to £24 per annum.

Any fees received in connexion with the appointment to be handed over to the City Council.

Candidates must be fully qualified and registered, must have specialised in Pathology, and have had experience in a recognised pathological department.

The officer appointed will be responsible for conducting the work of the laboratory under the general supervision of the pathologist of the Southern Group of Hospitals and will be required to coöperate generally with the medical staffs so far as this particular service is concerned. The appointment will be made in accordance with the Standing Orders of the City Council and will be determinable by three months' notice on either side.

Applications, stating whether R practitioner and whether liable for military service, age, nationality, qualifications with dates, experience, details of previous appointments, and accompanied by copies of three testimonials, should be endorsed "Junior Medical Pathologist" and sent not later than 10 A.M. Tuesday, 19th October, 1943, to: W. H. BAINES, Town Clerk.

Municipal Buildings, Liverpool, 2, October, 1943.

Surrey County Council.
WARREN ROAD HOSPITAL, GUILDFORD.
(General Hospital—450 Beds.)

Applications are invited from registered practitioners, Male and Female, for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B1). The position will be available for approximately the further duration of the war, and is subject to one month's notice on either side. Commencing salary according to experience at a point on the grade £350–£25–£450 p.a., plus full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications to the MEDICAL SUPERINTENDENT.

County Borough of Croydon.

Applications are invited from licentiates in dental surgery for the post of temporary Whole-time ASSISTANT DENTAL SURGEON. Salary £550 p.a., rising by annual increments of £25 to £600 p.a., plus cost-of-living bonus. The duties will consist chiefly of the inspection, re-inspection, and treatment of children attending elementary schools, dental work under the Council's Maternity and Child Welfare and Tuberculosis Schemes, and instruction in dental hygiene as required.

Applicants should have had at least one year's previous experience in the dental treatment of children; the person appointed will work under the supervision of the Medical Officer of Health and the Senior Dental Officer.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and the passing of a medical examination.

Applications (on forms obtainable from the Medical Officer of Health, 20, Katherine-street, Croydon, by sending a stamped addressed foolscap envelope) should be returned to him, accompanied by copies of three recent testimonials, not later than 11 A.M. on Monday, 25th October, 1943, endorsed "Assistant Dental Surgeon."

E. TABERNER, Town Clerk.

Town Hall, Croydon, 28th September, 1943.

County Borough of Blackburn.

Applications are invited for the post of MEDICAL OFFICER at QUEEN'S PARK HOSPITAL, Blackburn. The post will be for the duration of the war but terminable by three months' notice on either side. The salary is at the rate of £1100 per annum (inclusive of residential emoluments valued for superannuation purposes at £140 per annum), plus temporary war bonus. Applicants should have had experience of municipal hospital administration and hold a higher qualification in clinical medicine (preferably the diploma of membership of one of the Royal Colleges of Physicians).

The approval of the Ministry of Health to the filling of this vacancy has been given. The attention of candidates is drawn to paragraph 8 of Ministry of Health Circular 2818.

Further particulars and forms of application may be obtained from the Public Assistance Officer, Cardwell-place, Blackburn, to whom completed application forms should be returned not later than the 18th October, 1943.

Blackburn. CHAS. S. ROBINSON, Town Clerk.

Kent County Ophthalmic and Aural

HOSPITAL, MAIDSTONE. (158 Beds.)

Applications are invited from registered medical practitioners for the appointment of OPHTHALMIC HOUSE SURGEON (B1), now vacant. Applicants should have held house appointment and had experience in ophthalmology. The Hospital is fully recognised by the Examining Board for the D.O.M.S. Salary is at the rate of £350 per annum, with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 appointments and rejected by the R.A.M.C., may apply.

Applications, stating age, qualifications with dates, copies of testimonials, nationality, and present post, should be sent without delay to: JOHN W. STRICKLAND, F.H.A., Secretary.

Royal Hampshire County Hospital,

WINCHESTER. (462 Beds.)

Applications are invited from registered medical practitioners, Men or Women, for the appointment of HOUSE PHYSICIAN (A), vacant 1st November, 1943. The position carries with it obstetrical work. Salary at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications, stating age, qualifications with dates, nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

D. M. STANBURY, Acting Superintendent and Secretary.

The Duchess of York Hospital for

BABIES, MANCHESTER, 19. (80 Cots.)

Applications are invited from medical practitioners (Male and Female) for the posts of:—

JUNIOR RESIDENT MEDICAL OFFICER (A), for six months from 1st November, 1943. Salary at the rate of £100 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply.

SENIOR RESIDENT MEDICAL OFFICER (B1), vacant 1st December, 1943. The appointment is for six months. Salary at the rate of £175 per annum, with full residential emoluments. Suitably qualified R and W practitioners holding B2 appointments, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

Applications, accompanied by copies of three recent testimonials, to be sent by the 14th October, 1943, to—

LOUISE GILLESPIE, Secretary.

Southampton Children's Hospital.

The Board of Management invites applications for the post of ORTHOPÆDIC SURGEON to the Hospital. Candidates must be the holder of one of the highest surgical qualifications and have experience in Orthopædics.

Applications, stating full particulars, should be sent immediately to the SECRETARY at the Hospital.

County Borough of Southend-on-Sea.

SOUTHEND MUNICIPAL HOSPITAL, ROCHFORD, ESSEX.

Applications are invited from registered medical practitioners of either sex for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B2). Previous experience in the administration of anæsthetics is essential. The salary is at the rate of £325 per annum, with full residential emoluments, plus war bonus. The person appointed will be liable to pay superannuation contributions if the provisions of the Local Government Officers' Superannuation Acts are applicable. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise it will be for a period of one year and subject to one month's notice on either side.

Applications, stating age, nationality, qualifications, and experience, to be sent to the Medical Superintendent, Southend Municipal Hospital, Rochford, Essex, not later than the 18th October, 1943.

H. J. WORWOOD, Town Clerk.

Town Clerk's Office, Southend-on-Sea.

Huddersfield Royal Infirmary.

(321 Beds.)

Applications are invited for the post of HOUSE SURGEON (A). Duties to commence on 17th November, 1943. Salary at the rate of £150, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

Applications should be sent as soon as possible to—

H. J. JOHNSON, General Superintendent and Secretary.

Royal Isle of Wight County Hospital,

RYDE, I.W.

Applications are invited from registered medical practitioners, either sex, for the appointment of HOUSE SURGEON (B2), vacant 1st November next. The appointment will be for six months. Salary at the rate of £180 a year, with board, residence, and laundry. As this is the senior post, previous surgical experience is advisable. R and W practitioners who now hold A posts may apply.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent without delay to: A. S. GORDON, Secretary.

St. Bartholomew's Hospital, Rochester.

(201 Beds.)

Applications are invited from registered medical practitioners, Male, for the post of CASUALTY HOUSE SURGEON (A), vacant 7th November, 1943. Salary £200 per annum and full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications, stating age, experience, nationality, and qualifications, to be forwarded to the SUPERINTENDENT-SECRETARY as soon as possible.

Conishead Priory Emergency Hospital,

ULVERSTON, LANCS. (400 Beds.)

Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant in December, 1943. Applicants must hold a diploma of F.R.C.S. and have sufficient recent orthopædic and fracture experience to take charge of a Fracture "A" Department. The successful applicant will be enrolled in the E.M.S. and the salary, payable by the Ministry of Health, will be at the rate of £550 per annum, with full residential emoluments. Suitably qualified R and W practitioners now holding B2 posts, also R practitioners now holding B1 and rejected by the Services, may apply.

Applications, giving full details of age, medical school, qualifications with dates, experience, nationality, and accompanied by copies of three recent testimonials, should be sent to the MEDICAL SUPERINTENDENT.

The Gloucestershire Royal Infirmary

AND EYE INSTITUTION, GLOUCESTER.
(239 Beds—5 Residents.)

Applications are invited from medical practitioners (Male) for the appointment of HOUSE SURGEON (A), duties to commence immediately. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply. The appointment will be for six months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be addressed to the SECRETARY, Royal Infirmary, Gloucester.

Leicester Royal Infirmary.

Applications invited for vacancy of ASSISTANT MEDICAL OFFICER to the FEMALE VENEREAL DISEASES CLINIC. Three clinics weekly of two hours each.

Further particulars may be obtained from—

H. T. PLOWMAN, House Governor and Secretary.

29th September, 1943.

City and County of Newcastle upon TYNE.

SHOTLEY BRIDGE HOSPITAL.

HOUSE SURGEON (A) TO THE DEPARTMENT OF RADIOTHERAPY.

Applications are invited from registered medical practitioners, Male and Female, for the above post, vacant 23rd October. The successful candidate will also have opportunity of experience in medicine and surgery. The appointment is tenable for a period of six months, and the salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts are invited to apply.

Applications to be sent to the MEDICAL OFFICER OF HEALTH, Town Hall, Newcastle upon Tyne, 1.

Royal Cornwall Infirmary, Truro.

(330 Beds—5 Residential.)

Applications are invited from registered practitioners (Male or Female) for the appointment of HOUSE SURGEON (B2) to the OPHTHALMIC AND EAR, NOSE, AND THROAT DEPARTMENTS with some general surgical duties, now vacant. Salary is at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications should be addressed to the SECRETARY.

West Cornwall Hospital, Penzance.

(Total 202 Beds.)

Applications are invited from registered medical practitioners, Male, for the appointment of HOUSE SURGEON (A), vacant 1st November, 1943. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent to—

K. I. NEWELL, Secretary-Superintendent.

Victoria Hospital, Burnley.

(169 Beds.)

Applications are invited from registered medical practitioners (Male or Female) for the appointment of HOUSE SURGEON (A), now vacant. Salary at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise it may be extended.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of recent testimonials, should be sent to the undersigned immediately.

J. E. WHEATCROFT, Secretary.

The Burslem Haywood and Tunstall

WAR MEMORIAL HOSPITAL,
High-lane, TUNSTALL, STOKE-ON-TRENT.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of a HOUSE SURGEON (A), vacant immediately. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of six months.

Applications to: C. E. LOWNDES, Secretary.

St. Albans and Mid Herts Hospital,

Church-crescent, ST. ALBANS, HERTS. (58 Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT MEDICAL OFFICER (B2). Salary at the rate of £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications, giving full particulars, as soon as possible to Mr. P R. BATTISON, Secretary.

Lincoln County Hospital.

(Voluntary Hospital—200 Beds.)

Applications are invited from registered medical practitioners for the appointment of HOUSE PHYSICIAN (A), vacant 3rd November, 1943. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months.

ARTHUR MOORE, Secretary-Superintendent.

14th September, 1943.

Norfolk and Norwich Hospital, Norwich.

Applications are invited from registered medical practitioners, including R and W practitioners who now hold A posts, for the appointment of CASUALTY OFFICER (B2). Salary at the rate of £170 per annum, with full residential emoluments. To R or W practitioners appointment will be limited to six months.

Applications, stating age, qualifications, nationality, &c., and accompanied by copies of testimonials, should be sent to—

FRANK INCH, House Governor and Secretary.

The Warwickshire King Edward VII

MEMORIAL SANATORIUM, HERTFORD HILL,
Near WARWICK. (225 Beds, Pulmonary Tuberculosis.)

Applications are invited from registered medical Women for the post of JUNIOR MEDICAL OFFICER (B2). No previous professional experience necessary. Salary at the rate of £350 p.a., with full residential emoluments. W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise not exceeding one year.

Applications to be sent to the Medical Superintendent at the Sanatorium by 14th October, 1943.

L. EDGAR STEPHENS, Clerk to Joint Committee.

Shire Hall, Warwick, 22nd September, 1943.

Newark Town and District Hospital.

(70 Normal Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £175 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months. B. C. DION, Secretary-Superintendent.

Pontefract General Infirmary and

THE HYDES HOSPITAL. (112 Beds.)

Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE SURGEON (A), vacant immediately. Salary £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications should be sent to— D. J. RICHARDS,
23rd September, 1943. Secretary-Superintendent.

Coventry and Warwickshire Hospital.

Applications are invited from registered medical practitioners, Male and Female, including R and W practitioners who now hold A posts, for the appointment of HOUSE SURGEON (B2) for general surgical duties, vacant 15th November, 1943. The appointment is for six months. Salary is at the rate of £150 per annum, plus £20 per annum cost-of-living bonus, together with full residential emoluments.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, should be sent immediately to—

S. CECIL HILL, House Governor and Secretary.

County Borough of Preston.

SHAROE GREEN HOSPITAL. (250 Beds.)

Applications are invited from registered medical practitioners, Female, for the appointment of JUNIOR RESIDENT MEDICAL OFFICER (A), now vacant. Salary is at the rate of £200 per annum, with full residential emoluments. W practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months; otherwise not exceeding one year.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of three recent testimonials, to the MEDICAL SUPERINTENDENT, Sharoe Green Hospital, Fulwood, Preston.

Royal Sheffield Infirmary and Hospital.

THE ROYAL INFIRMARY, SHEFFIELD.

Applications are invited from registered medical practitioners (Male and Female) for the post of RESIDENT HOUSE OFFICER (A) (who may be asked to carry out the duties of House Physician and/or House Surgeon), now vacant. Salary is at the rate of £80 per annum, with full residential emoluments and a bonus of £20 payable at the expiration of six months' satisfactory service. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be limited to six months.

Applications should be sent forthwith to—

H. KINGSLEY PEARCE,
General Superintendent and Secretary.

The Royal Infirmary, Sheffield, 6, 25th September, 1943.

Victoria Hospital for Sick Children,

HULL.

The Board of the above Hospital requires a RESIDENT HOUSE SURGEON (A) (Lady) at a salary of £200 per annum, with board, residence, and laundry. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

Applications to be sent as soon as possible to the SECRETARY.

The Royal Liverpool Children's Hospital,

Myrtle-street, LIVERPOOL, 7.

The Committee invite applications for the post of CLINICAL ASSISTANT to EAR, NOSE, AND THROAT CLINIC, which will be a war-time one. A fee of 1½ guineas per session will be paid.

Further particulars may be obtained from the SECRETARY of the Hospital, to whom applications, giving full particulars, should be sent.

County Borough of Halifax.

Applications are invited from duly qualified and registered medical practitioners for the post of TEMPORARY (FEMALE) ASSISTANT MEDICAL OFFICER OF HEALTH (Maternity and Child Welfare), experienced in antenatal work, midwifery, and children's diseases, to hold consultations at the Antenatal and Maternity and Child Welfare Centres of the Halifax County Borough, and to perform such other duties as appertain to the office. She will be a member of the staff of the Medical Officer of Health and will work under his control and direction.

The salary will be £500 per annum, rising by annual increments of £25 to £700 and war bonus.

The consent of the Minister of Health has been obtained to the making of the appointment.

Candidates must submit with their applications full information as to their liability for military service, medical fitness, and position as regards deferment.

The person appointed will be required to devote the whole of her time to the duties of her office, and will not be allowed to engage in private practice.

Applications, accompanied by copies of not more than two recent testimonials, should be sent to me endorsed "Assistant Maternity Medical Officer" not later than the first post 16th October, 1943. W. USHER, Town Clerk.

Town Hall, Halifax, 25th September, 1943.

City of Plymouth.

MEDICAL OFFICER OF HEALTH'S DEPARTMENT.

CITY ISOLATION HOSPITAL—MOUNT GOLD ORTHOPÆDIC AND TUBERCULOSIS HOSPITAL.

Applications are invited from registered medical practitioners for the appointment of Whole-time TEMPORARY MEDICAL SUPERINTENDENT for the above hospitals during the absence on war service of the present holder, and probably for the duration of the war. Salary £800 per annum, with increments of £50 every two years, to £938, together with house, furnished or unfurnished, by mutual arrangement. Applicants must have had experience in the diagnosis and treatment of infectious disease, and will be responsible for the administration of the hospitals under the general direction of the Medical Officer of Health. Applications will not be considered from practitioners liable for service under the National Service Acts, and the appointment is subject to the passing of a satisfactory medical examination, and is terminable by three months' notice on either side.

Applications, stating age, qualifications, and experience, together with copies of three recent testimonials, should be sent as soon as possible to—

T. PEIRSON, Medical Officer of Health.

Seven Trees, Lipson-road, Plymouth.

Salisbury General Infirmary.

(Voluntary Hospital—225 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), now vacant. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.

Applications, stating age, nationality, and full particulars, together with copies of recent testimonials, to be sent at once to: JOHN WILLIAMS, Superintendent and Secretary.

Royal United Hospital, Bath.

Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE SURGEON (A) (Gynæcology and Anæsthetics). Salary £150 p.a., with board, residence, and laundry. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

J. LAWRENCE MEARS, Secretary-Superintendent.

24th September, 1943.

County Borough of Walsall.

MANOR HOSPITAL.

Applications are invited from registered medical practitioners, Male and Female, for the appointments of:—

JUNIOR ASSISTANT MEDICAL OFFICER (A). Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months; otherwise for a period of twelve months.

RESIDENT ANÆSTHETIST (B2). The salary is at the rate of £350 per annum, rising by £25 to £425 per annum, with full residential emoluments. The officer appointed will act under the direction of the Medical Superintendent, and perform such other duties as may be required. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise it will be for a period not exceeding four years.

Applications should be sent as soon as possible to—

JAMES A. M. CLARK, Medical Officer of Health.

Council House, Walsall, 27th September, 1943.

City of Manchester.

BOOTH HALL HOSPITAL. (760 Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (A), vacant 11th November, 1943. The basic salary for the appointment is £200 per annum, with board, residence, and laundry in addition, subject to the Manchester Corporation conditions of service. A temporary cost-of-living wages addition is payable in addition to the salary stated. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be limited to six months; otherwise for one year.

Applications, stating the full name, age (giving date of birth), nationality, professional qualifications (with dates), particulars of present appointment and past hospital appointments, are to be addressed to the Medical Superintendent, Booth Hall Hospital, Charlestown-road, Blackley, Manchester, 9, and must be received by him not later than 20th October, 1943. Canvassing in any form is prohibited. R. H. ADCOCK, Town Clerk.

Town Hall, Manchester, 2, 24th September, 1943.

County Borough of Rotherham.

DEPARTMENT OF HEALTH LABORATORY.

Applications are invited for the temporary position of Whole-time PATHOLOGIST at an annual salary of £750, plus cost-of-living bonus. The consent of the Ministry of Health has been obtained to the making of the appointment. The position will be subject to the provisions of the Local Government Superannuation Act, 1937, and to three months' notice on either side.

Applications, giving name, age, nationality, qualifications, and experience, together with full information as to liability for military service, medical fitness, and position as regards deferment, are to be submitted, endorsed "Pathologist," not later than 28th October, 1943, to: CHAS. L. DES FORGES, Town Clerk.

Municipal Offices, Rotherham, 22nd September, 1943.

West Suffolk General Hospital,

BURY ST. EDMUNDS. (415 Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE PHYSICIAN (A), from 1st November. Salary is at the rate of £150 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications, stating age, experience, qualifications, and nationality, should be sent, accompanied by copies of three recent testimonials, to: E. E. HARDWICKE, Secretary.

22nd September, 1943.

The Medical Defence Union

Established 1885

President: JAMES FENTON, C.B.E., M.D., M.R.C.P., D.P.H.

Telephone: MUSeum 1337

Annual Subscription £1

MEMBERSHIP EXCEEDS 26,000

Entrance Fee 10s.
Assets exceed £100,000

No entrance fee to those joining within twelve months of registration.

Each member is provided with UNLIMITED INDEMNITY (subject to the Articles of Association) against Damages and Costs awarded in any case undertaken by the Council on his behalf.

A single subscription for members wholly retired from practice.

Special facilities for the protection of the estate of a deceased member.

Full particulars from Secretary (Dr. ROBERT FORBES), The Medical Defence Union, Ltd., 49 Bedford Square, London, W.C.1.

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City Hospital, Nottingham.

The Nottingham City Council invite applications from duly qualified medical practitioners for a position as SENIOR HOUSE SURGEON (B1) at the above Hospital. Applicants should have held previous house appointments and had surgical experience. Preference will be given to candidates holding a qualification of F.R.C.S. Experience in treatment of fractures is essential and general orthopædic experience desirable. The salary will be £350 p.a., with board and residence. R and W practitioners holding B2 posts, also R practitioners holding B1 and rejected by the R.A.M.C., may apply.

The appointment is not permanent and is not within the Council's superannuation scheme. It is terminable by one month's notice on either side. J. E. RICHARDS, Town Clerk.

The Guildhall, Nottingham, October, 1943.

West Suffolk General Hospital,

BURY ST. EDMUNDS.
(191 Civilian Beds, 244 E.M.S. Beds.)

Applications are invited from registered medical practitioners, Male or Female, for the following A appointment, including practitioners within three months of qualification and liable under the National Service Acts, when appointment will be for six months: HOUSE SURGEON, with care of special departments. Vacancy 1st November. Salary £150 per annum, with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, should be sent with three copies of recent testimonials, to—

2nd October, 1943. E. E. HARDWICKE, Secretary.

Jenny Lind Hospital for Children,

NORWICH.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT MEDICAL OFFICER (B2). The salary is at the rate of £120 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications, with copies of testimonials, should be sent as soon as possible to: FRANK INCH, Secretary.

The Robert Jones and Agnes Hunt

ORTHOPÆDIC HOSPITAL, OSWESTRY.

Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT HOUSE SURGEON (B2), now vacant. Salary £200 per annum, with full residential emoluments. R and W practitioners who now hold A posts may apply, when appointment will be limited to six months.

Applications, stating age, nationality, qualifications, &c., with copies of testimonials, to be forwarded at once to—

JOHN C. MENZIES, Secretary-Superintendent.

City Mental Hospital, Nottingham.

Applications are invited from registered medical practitioners for the appointment of TEMPORARY ASSISTANT MEDICAL OFFICER (B1). The appointment is whole time. Previous experience in a mental hospital is desirable but not necessary. Suitably qualified R practitioners holding B2 appointments, also R practitioners now holding B1 and rejected by the R.A.M.C., may apply. Salary £350 to £450 per annum by four £25 increases, with full residential emoluments, with an additional £50 per annum for D.P.M.

Applications to be sent to the MEDICAL SUPERINTENDENT.

County Borough of Ipswich.

BOROUGH GENERAL HOSPITAL.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT MEDICAL or SURGICAL OFFICER (B1). Salary is at the rate of £350 per annum, plus full residential emoluments. Suitably qualified R and W practitioners holding B2 posts, also R practitioners holding B1 posts and rejected by the R.A.M.C., may apply.

Applications to the MEDICAL OFFICER OF HEALTH, Public Health Department, Elm-street, Ipswich.

Leicester Royal Infirmary.

Applications are invited for the post of OBSTETRIC HOUSE SURGEON (A) (Female) to the MATERNITY HOSPITAL, Causeway-lane (50 Beds). The appointment is for six months, commencing 1st December, 1943. Remuneration at the rate of £150 per annum. Practitioners within three months of qualification and liable under the National Service Acts may also apply.

Applications, with copies of testimonials, to be forwarded to the HOUSE GOVERNOR AND SECRETARY at the Infirmary on or before 19th October, 1943.

30th September, 1943.

The Royal Hospital, Wolverhampton.

(Incorporated under Royal Charter.)
(310 Beds.)

Applications are invited from registered medical practitioners for the appointment of HOUSE SURGEON (A) vacant 31st October. Salary is at the rate of £100 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

4th October, 1943. W. COCKBURN, House Governor.

Royal South Hants and Southampton

HOSPITAL, SOUTHAMPTON. (255 Beds.)

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (B2), vacant 28th October, 1943. The appointment will be for a period of six months. The salary is at the rate of £175 per annum, with full residential emoluments. R and W practitioners now holding A posts may apply.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of three recent testimonials, should be sent immediately to—

EDWARD L. WIRGMAN, House Governor and Secretary.

Nottingham General Hospital.

Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). Salary is at the rate of £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months.

Applications to be addressed to—

HENRY M. STANLEY, House Governor and Secretary.

Wanted immediately, Locum, Country

Practice, south-west, either sex, drive car, little midwifery, 2–3 weeks, October. British.—Full particulars: BM/MJAC, London, W.C.1.

Part-time Woman Locum wanted in

London for Prison work during December, January, and February.—Address, No. 339, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Wanted, Female Assistant for General

Practice in South Devon. Salary £500, all found. Able to drive, car provided.—Address, No. 338, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Laboratory Assistant required for work

in Pathological Laboratory. Applications, stating qualifications, previous experience, and salary required, should be sent to: Address, No. 337, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Lady Typist, familiar with medical

terms, wanted.—UNIVERSITY EXAMINATION POSTAL INSTITUTION, 17, Red Lion-square, W.C.1.

Experienced G.P. (exempt), aged 38,

seeks appointment or salaried post early 1944. Excellent past appointments, medico-literary, executive, specialised cardiology. English, married.—Full particulars, strict confidence: BM/MJAC, London, W.C.1.

Post required in Central London as

NURSE SECRETARY CHAUFFEUSE to Doctor. Over 3 years' nursing experience, 1½ as student nurse, but training not completed owing to slight injury to back. Age 24. Public school education, typing and simple book-keeping. Can come for interview any time.—Miss CROFTER, Ellergiven, Kendal.

Medical Practices and Nursing Homes

sold—Partnerships arranged—Valuations, Reports, &c.—Over 25 years' experience.—SONGHURST & RICKARD, Valuers and Surveyors, Guildhall Chambers, Exeter.

For Sale, Hamblin Ophthalmoscope.

Perfect order. £10.—Address, No. 340, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Wanted—£20, or agreed price, offered

for good pair BINOCULARS, Goerz, Leitz, or Zeiss, or good Terrestrial Telescope.—Dr. BLISS, Corbett Hospital, Stourbridge, Worcs.

Wanted, New or Secondhand "Studa"

CHAIR for High Colonic Irrigation.—Address, No. 325, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

£250 to £300 will be paid for accommo-

dation in a comfortable country home, preferably in a doctor's house, for elderly gentleman, perfectly healthy but subject to a form of melancholia and prefers solitude. Full particulars and doctor's report supplied.—Address, No. 336, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

May we send specimen of Comparator

STETHOSCOPE for clinical trial? (No obligation); see issue of 18-7-42.—Capac Ltd., 2, Ullswater-road, London, S.W.13.

Consultant (absent on war service)

offers his well-appointed Consulting-rooms at 21, WIMPOLE-STREET, W.1, from 3 guineas a week, including service and use of waiting-room (not telephone or electricity).—Apply RESIDENT MANAGERESS.

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of excellent CONSULTING ROOMS are available for full and part-time use at moderate rents. Particulars on application.—ELGOOD & Co., 1, Bentinck-street, Welbeck-street, W.1. Welbeck 8974.

War Emergency Pack

SEROCALCIN

for the prevention and treatment of COLDS

Serocalcin is helping to win the vital offensive against the common cold. A prophylactic course will ensure a three- to four-month period of immunity from colds in over 80 per cent. of cases. This percentage figure (see *Medical Press and Circular*, 10th October, 1940) has been confirmed by medical practitioners in all parts of the world over a number of years. The course consists of two tablets daily for thirty consecutive days. There are no "reactions" and Serocalcin is suitable for children and adults.

Successful in 80% of cases

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